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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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84 LAW AND POLITICAL SCIENCE 535
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 535
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 538
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 539
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 540
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 542
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 543
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 543

Note: N.A. means that no abstracts were assigned to this category for this issue.

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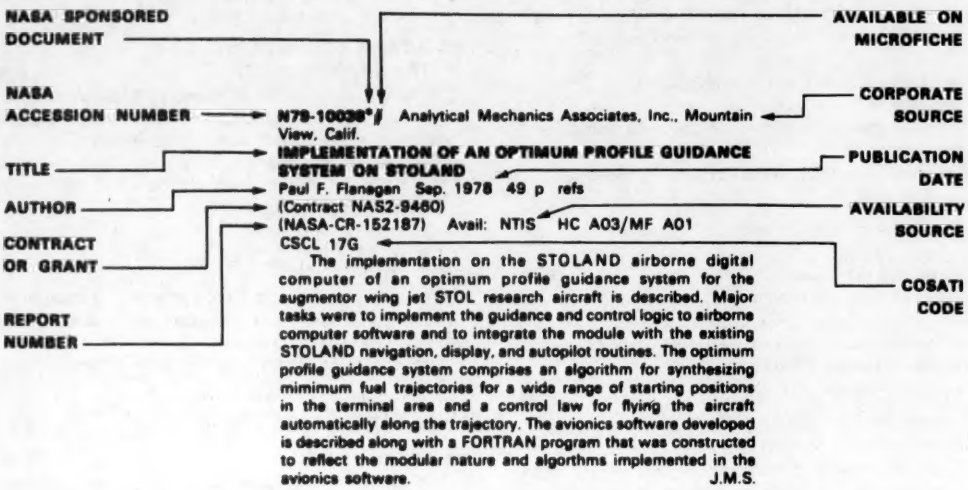
TYPICAL CITATION AND ABSTRACT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N79-10036*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
CORPORATE SOURCE
TITLE
IMPLEMENTATION OF AN OPTIMUM PROFILE GUIDANCE SYSTEM ON STOLAND
PUBLICATION DATE
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The implementation on the STOLAND airborne digital computer of an optimum profile guidance system for the augmentor wing jet STOL research aircraft is described. Major tasks were to implement the guidance and control logic to airborne computer software and to integrate the module with the existing STOLAND navigation, display, and autopilot routines. The optimum profile guidance system comprises an algorithm for synthesizing mimimum fuel trajectories for a wide range of starting positions in the terminal area and a control law for flying the aircraft automatically along the trajectory. The avionics software developed is described along with a FORTRAN program that was constructed to reflect the modular nature and algorithms implemented in the avionics software.
J.M.S.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects— not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, ANGULAR VIBRATION OF AIRCRAFT
W. GIBSON, Anamet Laboratories Inc., *Berkley, California* (DF139980; F33615-77-C-3050)

Vibration adversely affects the performance of airborne optical systems which require high pointing accuracy. Aircraft structural vibrations are composed of linear and angular motions. Little is known of the latter and therefore the allowable angular motions among components of airborne optical systems in the low microradian range are difficult to define. To design such systems to operate with optimum performance and reliability requires the accurate prediction of angular vibrations. The objective of this work is to generate forced response prediction techniques for angular vibrations and to verify their accuracy with experimental data.

Techniques are available for estimating the low- and high-frequency forced linear vibration response of aircraft. Such techniques shall be considered for their limitations, flexibility and subsequent modifications resulting in angular vibration predictions. Unique combinations of these prediction techniques by optimizing their capabilities will also be examined to provide overall improvement in reliability.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0002, COMPLETION OF FABRICATION OF IMPROVED ICE PROTECTED UH-1H ROTOR BLADES AND FLIGHT TEST SUPPORT OF SIMULATED AND NATURAL ICING TESTS
R.H. COTTON, Lockheed Aircraft Corporation, *2555 N. Hollywood Way, Burbank, California* 91503 (DA0D4080; DAAJ02-77-C-0002)

The objectives of this contract are to complete fabrication of new deiced rotor blades, improve various components of the UH-1H ice protection system, and to support government-conducted simulated and natural icing tests.

Contractor flight test personnel will assist in flight-test planning, perform maintenance of the peculiar hardware of the ice-protected, R and D, UH-1H helicopter, process and analyze flight test data and prepare a test report upon completion of the test program. The test report will be published by this directorate. Testing to be conducted by the government includes simulated icing tests using the Ottawa spray rig, operated by the Canadian National Research Council (NRC) and natural icing tests in the vicinity of Ottawa, Canada.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Air Mobility Research & Development Lab.

1.0003, ADVANCED STRUCTURES CONCEPTS R AND M/COST ASSESSMENTS
T.N. COOK, United Technologies Corp., Sikorsky Aircraft Division, *N. Main St., Stratford, Connecticut* 06602 (DA0E3788; DAAJ02-77-C-0061)

Establish R and M and life-cycle cost characteristics of advanced structures concepts as applied to Army helicopters.

(a) Perform a failure mode and effects analysis of existing advanced structures design concepts to evaluate the effectiveness of these concepts for minimizing Army aircraft structures field problems and repair costs. (b) Fabricate representative samples of the most promising structural design concepts and conduct laboratory testing to evaluate R and M characteristics. (c) Perform a maintenance evaluation of the most promising structural design concepts. (d) Prepare a R and M design considerations document. (e) Perform a cost analysis.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0004, ENGINE/AIRFRAME/DRIVE TRAIN DYNAMIC INTERFACE DOCUMENTATION
W.J. TWOMEY, United Technologies Corp., Sikorsky Aircraft Division, *N. Main St., Stratford, Connecticut* 06602 (DA0E3774; DAAJ02-77-C-0037)

The coupled interaction between two or more helicopter dynamic subsystems has often been the source of vibration problems. This is particularly true when considering the helicopter as a dynamic system in which excitations can be generated by any or all of the propulsion system, the airframe of the drive system. The problems of vibration related interface compatibility in engine/drive system installations are usually complicated by the inherent coupling of the three (3) major multi-degree-of-freedom systems, i.e., engine, airframe and drive train. All background data and documentation of past experience lies in the hands of the airframe/engine industry, primarily the former. The technical objective of this contractual effort is to document industry experience to the degree required to permit plans/programs to be formulated as part of an overall government effort to accumulate data which will eventually lead to a solution of generic problems of this type.

Award sole source contracts to the major manufacturers of gas turbine-powered US military helicopters, to review existing files, compile reports, memoranda, analytical design efforts, etc., and coordinate with appropriate engine manufacturers.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Air Mobility Research & Development Lab.

1.0005, ENVIRONMENTAL DEGRADATION OF STRESSED AND UNSTRESSED SANDWICH PANELS
UNKNOWN, Illinois Inst. of Technology, Graduate School, *3300 S. Federal St., Chicago, Illinois* 60616 (DN781168; N62269-76-C-0237)

To investigate the effect of different environmental exposures on stressed and unstressed sandwich panel construction.

GR/E faced adhesively bonded honeycomb core construction will be exposed to a variety of environments, both in a cumulative and cyclic fashion. This sandwich panel construction will be

exposed and placed in a state of stress most simulating actual service conditions on naval aircraft.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0006, REGRESSION SIMULATION TURBINE PERFORMANCE

R. SULKOSKE, General Motors Corporation, *4700 W. 10th St., Indianapolis, Indiana* 46206 (DF459820; F33615-77-C-2071)

The objective of this program is reduce the cost of using the procedures developed under the TEVCS/ARES programs (contracts F33615-73-C-2070 and F33615-73-C-2084, respectively) while maintaining or improving the accuracy levels necessary for a meaningful propulsion concept evaluation and/or cycle selection.

Based on the above objective, four major tasks have been identified for investigation and evaluation. Task I deals directly with reducing propulsion data generation costs by reducing parametric deck size and by improving computer execution time per data point. Task II reduces the amount of propulsion data required to assess a given engine design. Task III provides the data base necessary to permit the propulsion manufacturer to establish in-house the important preliminary propulsion characteristics based on a realistic airframe data base. This should allow the propulsion manufacturer to tailor general propulsion concepts to a specific application and to identify meaningful propulsion variables which are well suited for use in the TEVCS/ARES methodologies. Task IV is concerned with improving the accuracy of the present TEVCS/ARES regression procedures to improve concept evaluation and cycle selection capability and to accommodate possible inaccuracies due to the propulsion data cost reductions developed in Task I.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0007, IMPROVED AIRCRAFT/EXTERNAL STORE FLUTTER PREDICTION

M.A. FERMAN, McDonnell Douglas Astro. Co., *E. 411 St., St. Louis, Missouri* 63166 (DF140420; F33615-77-C-3087)

This work unit supports the area of aircraft/external store flutter prediction. Establishing flight flutter safety for military aircraft carrying large numbers and different combinations of external stores is presently costly and time consuming. The objective of this effort is to reduce the time and cost for aircraft/external store flutter prediction. This reduction is expected to reduce the time and cost required for establishing flight flutter safety of military aircraft carrying external stores.

Add the capability of including control surface tab flexibilities in vibration and flutter analyses using the FACES (flutter of aircraft carrying external stores) computer program of AFFDL-TR-75-101. Also, provide program maintenance as required.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0008, BODIES OF TRANSLATION

L. MITSCHANG, McDonnell Douglas Astro. Co., *E. 411 St., St. Louis, Missouri* 63166 (DF737540; F30602-77-C-0233)

The objective of this program is to develop an analytical technology which will be used to characterize the electromagnetic behavior of structures having a constant cross-sectional geometry (similar to an aircraft wing, tail, or fin). The structures of interest are those composed of finite conducting material. They will have maximum dimensions of 20 wavelengths in length and 10 wavelengths in perimeter. This technology will be used to develop a computer program with the capability of modeling these structures. It will also calculate the near and far electric and magnetic fields radiated or scattered from them, as well as the current distribution.

A numerical technique will be developed which will model the desired structure and predict its electromagnetic behavior. This technique will then be developed into a user-oriented computer code and implemented on the RADC computer. The computer code will be debugged and documented, provided in the form of a user's manual and a code documentation manual.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

1.0009, V/STOL GSE STUDY

R. CAHALL, U.S. Navy, Air Engineering Center, *Lakehurst Naval Air Station, Lakehurst, New Jersey* 08733 (DN696011)

Conduct a support engineering analysis of the V/STOL type aircraft to determine support suitability of existing GSE or requirement specifications for new equipment. Analysis will also extend to support requirements for 'advanced systems' aboard such aircraft, e.g.: composites, high-press hydraulics, etc.

Two-phase program. Phase 1 will define support requirements for the V/STOL type aircraft. Phase 2 will apply the concepts developed in Phase 1 to GSE, existent and required as a result of the study.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0010, WEIGHT AND COST IMPACT OF DAMAGE TOLERANCE CRITERIA ON NAVY AIRCRAFT

P. BELL, Grumman Corporation, *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN881382; N62269-77-C-0174)

To make an analytical assessment of the weight and cost impact of damage tolerance criteria, specifically those of A.F. specification MIL A 83444, on a Navy fighter aircraft. This contract will support work unit ZA 601, 'Aircraft Technology' Agency Accession DN 681080.

The specification MIL A 83444, 'Airplane Damage Tolerance Requirements' will be analytically applied to the Navy F-14 aircraft. This aircraft was not designed to this specification so hypothetical redesign required to meet the specification can be quantitatively translated into weight and cost. The impact of this specification on the structural reliability, weight and cost of Navy aircraft can then be assessed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0011, STUDY THE EFFECT OF SERVICE LIFE ON THE STRUCTURAL DURABILITY OF BORON/EPOXY COMPOSITE AIRCRAFT STRUCTURES

P. DONOHUE, Grumman Corporation, Grumman Aerospace, *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN790077; N00019-77-C-0412)

To obtain knowledge on the practical and analytical considerations of the service durability of boron/epoxy composites.

The tests will consider the effects of service life upon the basic laminate and the adhesive bond lines of the integrally molded stepped titanium splice-to-laminate and laminate-to-aluminum honeycomb core joints.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0012, INSTALLATION OF F-14 COMPOSITE OVERWING FAIRINGS AND MAIN LANDING GEAR DOOR

J. MAHAN, Grumman Corporation, *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN881340; N62269-77-C-0385)

To install a limited number of composite main landing gear strut doors and overwing fairings on modified F14 aircraft. This work is being performed as part of the service evaluation of composite structures being conducted to demonstrate the service durability and structural reliability of advanced fiber-reinforced composite aircraft structures under actual Navy operational usage. This work is in support of work unit ZA601, 'Aircraft Technology', Agency Accession No. DN681080.

Five ship sets of composite overwing fairings and nine ship sets of composite main landing gear strut doors will be installed on Navy fleet F-14 aircraft. Since neither assembly is directly interchangeable with the current F-14 production part, the necessary nonstructural modifications to the aircraft in accordance with the installation procedures established under previous contracts will be performed prior to installing the components. At the completion of the installation operations, ground fit and function tests will be performed for each set of components. The com-

posite components will be subjected to service usage and operational environments and their condition will be monitored during the life of the aircraft. The components will be removed periodically for laboratory tests. Kits will be provided for use by Navy personnel to restore the aircraft to accept the production metal components after the composite components are removed from service. (This contract covers only the installation of the components, not their manufacture or service monitoring.)

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0013, TI/AL DESIGN/COST TRADE OFF ANALYSIS
D.O. NASH, General Electric Company, *1 Jimson Rd., Cincinnati, Ohio* 45215 (DF461680; F33615-77-C-2066)

The primary objective of this program is to evaluate suitable applications for titanium aluminide alloys in gas turbine engines. It shall be determined if these alloys offer a viable alternative to nickel-base superalloys. Studies of static and dynamic components, fabricated from various manufacturing processes, will be conducted to discern all potential areas of application from a structural, economic, and life cycle cost viewpoint.

A design/cost trade-off analysis of titanium aluminides in the wrought cast, forged, rolled and power metallurgical states shall be made for both static and dynamic component applications. Finite element analyses shall be conducted to determine stress/strain distributions of the various component configurations with loadings and boundary conditions that are commensurate with the actual operating environments of the components. The critical areas of all components will be identified as well as the limiting material properties for that application. Potential methods of optimizing the limiting properties will be discussed plus an overall assessment of practically applying the materials to this type of component. In addition, the optimum applications for wrought material, cast, forged, rolled and powder metal forming shall be specified.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0014, HIGH AOA ANALYSIS OF ADVANCED AERODYNAMIC CONTROL SYSTEM
T.J. CORD, U.S. Air Force, Flight Dynamics Lab., *Wright Patt. A.F.B., Dayton, Ohio* 45433 (DF141600)

The military has been plagued with the problems of aircraft performance and loss-of-control at high-angle-of-attack flight conditions, such as those encountered during air-to-air combat. The technical objective is to provide and analyze a design for a wing/flap system for fighter aircraft. This will allow more efficient use of the aircraft wing and improve both flying qualities and combat maneuver potential.

Wind-tunnel tests of a modified YF-16 obtained from work unit 82190510 will be analyzed with respect to both stability and control and performance. Additional wind-tunnel tests will be conducted and flap positioning system based on differential pressure will be designed and acquired. Additional wind tunnel tests will be performed to evaluate the system.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0015, ANALYTICAL EQUIPMENT FOR TURBINE ENGINE CHECKOUT
K. HAMILTON, U.S. Air Force, Aeropropulsion Laboratory, *Wright Patt. A.F.B., Dayton, Ohio* 45433 (DF460790)

To procure equipment and instrumentation for turbine engine checkout as GFE, in-house test support, and for flight test efforts.

System requirements are defined in procurement specifications that will result in accurate, reliable and cost-effective test equipment applications. Non in-house work effort support is picked up by this work unit from former work unit 30661318.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0016, ATMOSPHERIC ELECTRICAL HAZARDS TO AIRCRAFT
V.L. MANGOLD, U.S. Air Force, Flight Dynamics Lab., *Wright Patt. A.F.B., Dayton, Ohio* 45433 (DF141930)

More sophisticated electronic systems and advanced structural materials are being used in USAF aircraft, which will require hardening to the natural atmospheric electricity hazards (AEH) environment. Research is required to evaluate the susceptibility of these systems and materials. This effort will provide a data base to be used for the evaluation of the susceptibility of aircraft to the deleterious effects of the AEH environment and provide the technology for evaluating and hardening these systems and materials to this natural environmental threat. The data generated from this work effort will be used by the Air Force to define the natural AEH environmental threat, to provide the basis for development of test techniques and facility designs for assessing aircraft systems and materials to the AEH environment, and to assist in the development of design guides for hardening aircraft systems and materials to the AEH enviromental threat.

The approach will be to conduct flight programs to measure and define the natural AEH environment and its effects on electronic systems. Ground test facilities will be developed and experimental test techniques to simulate and assess the susceptibility of aircraft systems to the AEH envionment will be developed, refined and validated. The data generated from these programs will be documented in the form of guides describing the characteristics of the natural AEH environment, specifications for test techniques and simulation facilities, and inputs into design guides for hardening aircraft systems to the natural AEH environment.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0017, REDUCTION OF RAW EXPERIMENTAL DATA
P.A. GRAF, Univ. of Dayton, Res. Inst., *300 College Park Ave., Dayton, Ohio* 45409 (DF137600; F33615-77-C-3057)

Significant amounts of experimental data are currently being acquired during in-house test programs on parachutes and other equipment for military vehicle recovery applications. The data reflect performance and design characteristics of new fibrous parachute materials and design parameters for impact attenuation devices for RPV landing applications. The objective of this effort is to provide for the expeditious reduction of the data in a form suitable for analysis and evaluation. The availability of the reduced data shortly after completion of experimental tests will reduce the technical and cost risks during concept evaluation and development of fibrous parachute materials and permit immediate improvement in impact attenuation systems used on RPV's.

Raw experimental test data acquired during in-house programs is submitted for reduction, conversion into physical quantities measured, and plotting and/or tabulation as a function of selected parameters. Raw experimental data may consist of force, pressure, velocity, acceleration or displacement versus time traces recorded on oscillograph paper, of photographic recordings of moving or shape-changing objects, of still photographs and other recording or indicating apparatus.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0018, A-7 AIRCRAFT ARMAMENT SYSTEM (PYLON CABLES) RIA FOR LIFT/CRUISE FAN V/STOL AIRCRAFT
C. ABRAMS, U.S. Navy, Air Vehicle Technology Dept., *Warminster, Pennsylvania* 18974 (DN881124; N62269-77-C-0163)

To develop the criteria and specifications for an advanced flight/propulsion control system and suitable pilot displays for a Navy multimission lift/cruise fan aircraft. This effort supported by work unit DH820B., control in future production of pylon electrical cables. The test program shall subject the electrical cable assemblies to all of the environments and physical stress they will undergo in actual fleet use. this contract supports work unit SW803, Agency Accession No. DN581110.

Investigations will be conducted to define flight control requirements for a lift/cruise fan vehicle. Flying qualities criteria will be established for the design of a flight control/display system suitable for all modes of flight including hover maneuvering,

transition maneuvering, cruise maneuvering, take-off and landing. The flight control development will address integrated propulsive and aerodynamic control concepts, failure mode effects, pilot station controls and displays, control impact of mechanical versus gas driven fans, actuation concepts and system reliability. The ability of the flight control/display system to provide satisfactory flying qualities will be demonstrated through piloted simulation.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0019, HT PP 78-13 - DRIVE TRAIN COST ANALYSIS
UNKNOWN, U.S. Army, Applied Technology Laboratory, *Fort Eustis, Newport News, Virginia* 23604 (DA0E3825)

Conduct a detailed cost analysis on helicopter drive systems. objective will be to establish a baseline for drive system fabrication development and acquisition costs. Cost comparison will be made and R and D programs developed. Normal operating precedural suggestions will be made where cost savings are apparent.

Perform detailed review of the cost history of major drive train components. Review will encompass the identification of cost drivers from the establishment of requirements through development of unit production cost spares acquisition. An analysis will include comparisons of variations in individual elemental costs. Principal disciplines involved in overall component costs will be identified, and cost savings recommendations will be made. Approaches will be developed to accomplish R and D efforts directed toward reductions in life-cycle costs, drive system components and assemblies.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, CHEMICAL STRUCTURE/BONDING DECOMPOSITION RELATIONSHIPS
J.W. BECKMANN, U.S. Air Force, Chemistry & Biol. Sci. Dept., *A.F. Acad., Colorado Springs, Colorado* 80840 (DF281610)

AF function - rocket propulsion, weapons, conventional, high explosives. Deficiency - existing technology is insufficient to adequately predict compatibility and aging characteristics of energetic materials. Research - to correlate chemical structures with decomposition mechanisms, thermal et al. How research contributes -provides a basic understanding of structure property relationships on which to base prediction of compatibility, aging and detonation properties. Abstract - kinetics and product analysis of decomposition of energetic materials will be investigated. Emphasis will be placed on decompositions induced thermally, by electron impact and by shock. Isotopic labels will be used to delineate mechanisms. Both model compounds and commercial materials will be used.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Frank J. Seiler Research Lab.

3.0002, MATERIALS SUPPORT TECHNOLOGY - DIMENSIONAL STABILITY AND MICROCREEP BEHAVIOR OF GYRO-STRUCTURAL MATERIALS
A.W. RUFF, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (DN775553; N00014-77-F-0041)

The overall objective of this program is to apply materials research to gryo-structural materials used in the inertial measurement units that provide guidance and control to space vehicles and missiles. The immediate goals are (1) to measure static dimensional stability and microcreep behavior of gyro-structural beryllium alloys and (2) to investigate the causes and mechanisms responsible for microdeformation of these materials. The first part calls for extremely small and accurate measurements of strain distortion with a precision of plus or minus ten to the minus seventh power initially and plus or minus ten to the minus eighth power in the second year. The second part requires detailed and comprehensive microstructural characterization and accurate analyses of chemical composition, which will be correlated to provide an explanation for the measured strain distortion and microcreep. The work will be coupled to related work groups at the Draper Laboratory.

Initial measurements will be made on commercial Be-6 weight percent oxygen alloys. Microcreep will be measured using displacement transducers. An optical displacement measuring technique will be developed and debugged to permit future measurements at plus or minus ten to the minus eighth power. A holographic/interferometric displacement measuring and loading system will be designed and built to measure deformations of a hydrostatically loaded structural shape of simple geometry. Assorted microstructural studies and chemical analyses will be carried out on test materials both as-prepared and as-deformed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0003, DEVELOPMENT OF IMPROVED HIGH-STRENGTH ALUMINUM P/M PRODUCTS
K.J. GRUNDHOFF, D F V L R Flughafen, *West Germany, Federal Republic of Germany* (DF289500; AF-AFOSR-3440-77)

AF function - research in improved and lower-cost airframe components. Deficiency - present high-strength aluminum alloys suffer from stress corrosion and fatigue problems plus high cost of fabrication. Research - the objective of this technical effort is to determine the processing and metallurgical factors controlling the structure - fatigue behavior relationship in high-strength aluminum powder metallurgy products. The aim is to develop a processing schedule based on a desired microstructure that will yield improved combinations of fatigue behavior and acceptable other mechanical properties. A secondary objective is to determine the effect of hot isostatic pressing (HIP) to near net shape. How research contributes - if the true cost saving potential of powder is to be realized, near net shape processes, such as HIP, and their effect on the improved combination of mechanical properties already demonstrated by ALCOA, namely fracture toughness, need to be investigated.

The program will develop a processing schedule based on a desired microstructure that will yield improved combinations of fatigue behavior and other mechanical properties. It will also examine the effect of HIP processes on resultant properties with the intention of optimizing properties and lowering component fabrication.

SUPPORTED BY U.S. Dept. of Defense, Air Force, European Office of Aerospace Research & Development

3.0004, TUNABLE LASER SPECTROSCOPY OF POLYATOMIC MOLECULES
R.W. FIELD, Mass. Inst. of Technology, School of Science, Chemistry, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139

A versatile tunable laser laboratory has been established. Experiments include the technique of optical double resonance spectroscopy, with applications to the analysis of complex band systems, molecular relaxation rates, radiationless transitions including predissociation, and electronically 'inaccessible' excited states. Tunable lasers are also used in the study of nonequilibrium transport processes, radiation-induced chemical instabilities, and laser-induced chemical reactions.

SUPPORTED BY Massachusetts Inst. of Technology

3.0005, ADVANCED HYDROCARBON FUELS
W. TAYLOR, Exxon Res. & Engineering Co., *1600 Linden Ave., Linden, New Jersey* 07036 (DN796814; N00140-74-C-0618)

To develop a high thermal stability JP-5 fuel that will meet the requirements of high Mach number aircraft. This new fuel will retain the physical characteristics of precent JP-5 in order to be used interchangeably in lower-speed aircraft.

Study the effects of molecular oxygen removal (deoxygenation) as a method of increasing the thermal stability of JP-5. Conduct tests by heating experimental fuels in the range of 335-593 degrees C (600-1100 F) in an advanced fuel simulator and determine deposit formation rates. Determine the effects of contaminations, inhibitors and engineering variables on offsetting the benefits of deoxygenation.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

3.0006, CHARACTERIZE HIGH-TEMPERATURE-RESISTANT ADHESIVE SYSTEMS
J. FASOLD, Rockwell International Corp., *4300 E. 5TH Ave., Columbus, Ohio* 43216 (DN881165; N62269-76-C-0491)

To characterize two different high-temperature-resistant adhesive systems in a load/environment system. This contract supports work unit ZM501, DN681081.

Two candidate adhesive systems will be selected and used to bond 6Al-4V titanium adherend specimens for static stress, fatigue, fracture toughness and crack extension tests. Tests will be conducted in severe environments of high humidity and elevated temperature to fully characterize the adhesives.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

3.0007, DEUTERATION OF FLUIDS FOR NAVAL AIRCRAFT
N. REBUCK, U.S. Navy, Air Development Center, *Warminster, Pennsylvania* 18974 (DN933001)

The goal of this program is to provide scientific guidelines for the next generation of aircraft fluids based on deuterium modified molecules. A more complete definition of deuteration processing will define directional information for new approaches to wide temperature range fluids combined with extreme pressure lubricant effects.

Our approach in this investigation involves the exchange of hydrogen atoms in a synthetic fluid with deuterium atoms via a liquid/gas phase transfer mechanism in the presence of a suitable catalyst. The properties of the resultant deuterium modified fluid are investigated in the fluid state as well as compounded into a grease formulation.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

3.0008, STUDY OF FATIGUE MECHANISMS IN AEROSPACE STRUCTURAL MATERIALS
J. LANKFORD, Southwest Research Institute, *8500 Culebra Rd., San Antonio, Texas* 78228 (DF051120; F49620-78-C-0022)

AF function - the development of stronger materials by alloying and processing approaches continues to result in both airframe and gas turbine engine alloys that offer the possibility of substantial performance improvements in current and future aircraft. Opportunity -fatigue properties, which are often the life-limiting consideration for these applications, have not always kept pace with the increase in other mechanical properties. Objectives - this research will identify the physical mechanisms responsible for the fatigue behavior of aluminum airframe alloys and titanium engine materials, and define guidelines to meet the property improvements sought by the Air Force. How work contributes - the approach will involve extensive utilization of a scanning electron microscope (SEM) that has been modified to provide two unique capabilities. Selected area channeling contrast and patterns as well as a cyclic loading stage that operates within the viewing chamber of the SEM will both be used to characterize the micromechanisms of deformation and fracture that control fatigue crack initiation and propagation.

In the case of the aluminum alloys, emphasis will be placed on crack tip behavior (plastic zone size and shape) and its relationship to crack growth properties on alloys 2024, 6061, and 7075 and MA87 for both continuous cycling at uniform stress amplitudes and for overload conditions. The titanium program will focus on crack initiation and the very early stages of crack propagation under both continuous cycling and cycling with dwell periods.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0009, MATERIALS SUPPORT TECHNOLOGY - DAMAGE MECHANISMS AND FAILURE MECHANICS OF CARBON-CARBON COMPOSITE MATERIALS
D.F. ADAMS, Univ. of Wyoming, School of Engineering, Mech Engin, *P.O. Box 3435, University Station, Laramie, Wyoming* 82070 (DN775655; N00014-77-C-0503)

Carbon-carbon materials are used in propulsion and reentry components of advanced strategic systems. Failure modes and mechanical properties are significantly affected by initial flaw and defect distributions. Significant damage (beyond the initial) can occur throughout the part under load before failure occurs. This research program will identify damage modes and the sequence of constituent failures.

A significant number of carbon-carbon test specimens will be loaded to various fractions of the ultimate stress; acoustic emission and strain gage techniques will be used to determine damage thresholds and levels. Specimens will be successively sectioned and microstructurally examined to catalog and identify damage and failure mechanisms. An analytical effort will support the experimental effort.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, EXTINCTION OF LASER RADIATION BY SMALL PARTICLES
D.R. HUFFMAN, Univ. of Arizona, School of Liberal Arts, Physics, *Tucson, Arizona* 85721 (DN790029; N00019-77-C-0293)

The objective is to study absorption and scattering of laser radiation in the 10 micron spectral region as a countermeasure to the effects of such radiation.

A combination of related theoretical and experimental studies are proposed to help determine the most efficient method for extinction of CO2 laser radiation by small particles. The two major systems are (1) very small silicate particles where absorption dominates, and (2) hollow glass spheres, where scattering is expected to dominate.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0002, CODING TECHNIQUES FOR RPV AND SAR IMAGES
C. MCCARTNEY, Univ. of Southern California, Graduate School, *3551 University Ave., Los Angeles, California* 90007 (DN788556; N00123-76-C-1246)

To develop an efficient technique of transmitting radar images from remotely piloted vehicles (RPV) to ground stations, compatible with rather severe power and volume restrictions on the transmitter. This work supports DN334623.

To evaluate the performance of hybrid intraframe and interframe coders on non-pictorial data such as synthetic aperture radar (SAR) imagery.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Ocean Systems Center

4.0003, ENGINEERING RESEARCH INITIATION - ELECTROOPTIC MATERIALS AND OPTICAL IMAGE STORAGE DEVICES
A.R. TANGUAY, Univ. of Southern California, Graduate School, *3551 University Ave., Los Angeles, California* 90007 (ENG78-05617)

A research program on electrooptic materials and optical image storage devices directed toward the development of high-resolution, highesensitivity, recycleable real time image storage devices will be conducted. The electrooptic materials of interest are bismuth silicon oxide, bismuth germanium oxide, and other isomorphic compounds. The program will encompass crystal growth of optical quality materials, characterization of optical and electrooptic material properties by a novel technique, and fabrication and evaluation of the devices according to optimized design criteria. Theoretical analyses and experimental verification of device optical transfer characteristics will be performed.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0004, LASER WINDOW FINISHING AND COATING TECHNOLOGY

M. BRAUNSTEIN, Hughes Aircraft Company, Research Laboratories, *3011 S. Malibu Canyon Rd., Malibu, California* 90265 (DF902970; F19628-76-C-0309)

AF function - long-range detection. Deficiency/opportunity - models for simulating HF propagation in the arctic (auroral) environment are not sufficient to adequately predict the performance of Air Force systems or provide information for the design of new techniques to improve operational capabilities. Objective - development of new theoretical and numerical models of ionospheric characteristics which influence radio wave propagation and the design of improved ray-tracing techniques. Development of a better understanding of radio propagation through small scale irregularities in the ionosphere, and improvement of state-of-the-art of radio signal detection in the presence of fading and clutter due to propagation through an inhomogeneous ionosphere. How research contributes - this research is directed at improving the inputs to a realistic model of HF propagation, particularly in the auroral region of the ionosphere. These new models in conjunction with fast and accurate ray tracing will allow assessment of system performance to be made in near real time and with models of auroral HF clutter allow for both prediction of system performance and improved operational capabilities of existing systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0005, TEAL RUBY SIMULATION STUDY

E. WINTER, Internat. Bus. Machines Corp., Federal Systems Division, *2675 Towngate Rd., Thousand Oaks, California* 91361 (DF368238; F04701-77-C-0172)

The study will evaluate data processing concepts through simulation in determining the feasibility of detection of aircraft from space using step/stare mosaic focal planes in support of the teal ruby program. Contract F04701-77-C-0107.

The study will identify applicable background phenomenology, sensor and target models; select and define candidate target identification/track algorithms; upgrade the multi-optical sensor simulation II (MOSS-II) system; evaluate candidate algorithms to determine performance sensitivity and risk areas which would impact development of an operational system.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Space & Missile Systems Org.

4.0006, DIFFERENTIAL PRESSURE TRANSDUCER DEVELOPMENT

R. GRANNELLS, United Technologies Corp., Hamilton Standard Division, *Bradley Field Rd., Windsor Locks, Connecticut* 06096 (DN889786; N00140-78-C-0073)

The principal objective of this effort is to develop and demonstrate a high-accuracy differential pressure transducer, designed to sense the fan discharge Mach number in an advanced military aircraft gas turbine engine, and to be used in conjunction with advanced digital electronic fuel controls. The accuracy goal is 1% of point over a range of 0.25 to 25.0 psi differential at absolute pressure levels of 2 to 100 psia. The reliability goal is 100,000 hours MTBF. The response goal is a system time constant less than 20 milliseconds.

This effort will design, fabricate, and test a miniturized vibrating cylinder pressure transducer. Design optimization for size will be followed by two hardware interations with breadboard testing. The finalized sensor will undergo performance and environmental testing followed by delivery of two units to NAPC.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

4.0007, PROBING OF TRANSONIC BOUNDARY LAYERS 15172-E

J.E. DANBERG, Univ. of Delaware, School of Engineering, Mech & Aerospace Eng, *Newark, Delaware* 19711 (DA0F9168; DAAG29-78-G-0057)

To probe the boundary layer on spinning and non-spinning projectiles with the aim of developing physical insight into the reasons for the observed strong variations in pitching moment and magnus force and moments at transonic speeds. Relevance - the proposed investigation is directed toward obtaining a physical understanding of large pitching moment variations observed at transonic speeds on several of the Army's projectiles being evaluated by BRL. Consequently, the research is directly relevant to performance prediction and development of stable long-range gun-launched projectiles.

Pitot probing of the flow field will be one of the main techniques used to obtain new information on the state of the boundary layer on the projectile afterbody. The measurement technique will be verified for certain flow conditions and will then be applied to realistic boattails.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

4.0008, WAVEGUIDE LASER DEVELOPMENT

H.P. LAYER, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (2131126)

OBJECTIVE: The objective of this project is to design and construct infrared waveguide laser systems which will be applied to metrological, spectroscopic, and air quality measurement studies.

APPROACH: The steps to be followed in the execution of this project are: (a) make the necessary calculations to determine the best optical, mechanical, and electrical design for flowing gas systems, (b) generate specifications and drawings for component purchase and manufacture, (c) fabricate the waveguide laser systems, (d) characterize the laser performance, and (e) with the information thus gained investigate the feasibility of similar sealed-off (i.e. non-flowing) lasers and for lasers which are stabilized by intracavity absorption.

SUPPORTED BY U.S. Dept. of Commerce, National Bureau of Standards

4.0009, RADIOMETRIC DETECTABILITY OF ANOMALOUS TROPOSPHERIC REFRACTION

J.P. HOLLINGER, U.S. Navy, Res. Laboratory, *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680162)

To develop a real time, in situ capability to detect the presence of anomalous refraction conditions using microwave radiometry. Successful completion of this work will significantly improve the performance of the Navy's surveillance radars and communication system.

The refractive atmospheric regions which cause ducting, shading and radar holes also change the effective direction of reception of a radiometric system and can result in a significant change in the measured radiometric temperature. High-resolution, scanning, microwave radiometric measurements of dispersive atmospheric regions will be made to investigate and quantify this behavior. Optimum system parameters will then be specified for an operational anomalous dispersion detection system.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0010, HEAVY ION BEAM PROGRAM
J.M. KIDDANO, U.S. Navy, Res. Laboratory, *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680431)

We propose to study heavy ion interactions with tissue-like targets in the energy region 100-500 meV/U. Measurements will be made of production cross sections for secondary particles and their transverse momentum distributions. Results are applicable to cellular radiation biology, cancer therapy and spacecraft shielding calculations. Calculations of dose and linear energy transfer (LET) distributions will be made for various heavy ion beams.

Experiments are to be conduted at the Lawrence Berkeley Laboratory where beams of atomic number 6 less than z less than 36 are available from the bevalac accelerator. Targets of tissue-like materials e.g., c., n., o. will be used. The detector system will measure production angles, multiplicities, time of flight, energy deposition and ranges. This information is sufficient to determine the differential cross sections and transverse momentum distributions as well as the total inclusive cross sections.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0011, NAVAL VEHICLE TECHNOLOGY - RESEARCH ON STRUCTURAL RELIABILITY ASSESSMENT METHODOLOGY
R.J. SANFORD, U.S. Navy, Res. Laboratory, *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN580001)

Current Navy emphasis on the development of high-performance ships, weight-critical missiles and aircraft has increased the demand for improved methods of structural reliability assessment. This program provides this through the development of new approaches and methods for nondestructive evaluation and experimental stress analysis.

For nondestructive evaluation new techniques for the internal visualization of opaque materials are being developed. The work in experimental stress analysis emphasizes new methods of full-field observation, utilizing optical holography and other coherent optical methods.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0012, RADIATION-RESISTANT FIBER OPTICS
G.H. SIGEL, U.S. Navy, Res. Laboratory, *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680034)

The objective of this program is to prepare and characterize radiation-resistant optical glasses which are acceptable for fiber-optic waveguides in military systems and to draw these materials into fiber form for testing and evaluation. The Navy needs the advantages of fiber-optic transmission links, while maintaining survivability in tactical situations.

Fiber-optic grade glasses will be prepared and radiation damage and protection mechanisms will be identified. Purification, selective doping, redox conditions and compositional variation will be employed to minimize darkening under ionizing and particle irradiation. Promising materials will be drawn into fiber form. Emphasis is on achieving a radiation-resistant, medium-loss, high numerical aperture fiber for use in Navy avionic systems. Both the spectral and the temporal response of the fibers to irradiation will be determined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0013, POWER SUPPLY INVESTIGATIONS
J.H. JENTZ, U.S. Navy, Avionics Facility, *Indianapolis, Indiana* 46218 (DN797008)

The objectives of this program are to improve the Navy's power supply technology base of universal input, off-line switching regulators; establish existing NASA computer analysis techniques at NAFI for fast, economical switching regulator analysis; and perform switching regulator component evaluations. All of the above will directly aid the development of the standard electronic module (SEM) and the standard avionics module (SAM) power supply families.

Areas of investigation will include: (1) off-line universal input switching regulator techniques will be reviewed, trade-offs performed, and breadboards of the best approaches will be built and evaluated for performance, size, weight, complexity, cost etc; (2) component evaluations on the latest high-voltage semiconductors, high-current Schottky rectifiers, 4-terminal high-performance capacitors, EMI filters, hybrid and monolithic switching regulator control circuits. Control circuit manufacturers will be contacted and provided with suggested areas of improvement when considered worthwhile; (3) computer modeling and analysis programs for switching power supplies have been under development by TRW for NASA during the past few years. The usefulness and applicability of programs will be evaluated for NAFI use as they evolve.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0014, FINITE-ELEMENT METHODS IN FLUID DYNAMICS
N. GEFFEN, Tel Aviv University, Applied Mathematics, *155 Herzl St., Ramat Aviv, Tel Aviv, Israel* (DN875116; N00014-77-G-0055)

The development and rapid dissemination of accurate methods to predict the flow about naval ships, aircraft and missiles is essential for the efficient design of such systems. Through Navy participation in the support of this meeting on finite-element methods for non-elliptic problems, the latest information in this rapidly changing area will become available, more immediately, for naval use.

Under joint sponsorship of the Office of Naval Research and the Air Force Office of Scientific Research, this meeting on finite-element methods is being arranged to bring together at Tel Aviv University, Israel (25-29 July 1977) research scientists from universities, industrial laboratories and government departments for the presentation of new research results and to assess the current status and future trends of research problems in the field of finite element numerical methods for non-elliptic problems in fluid and plasma dynamics. These funds are to provide for expenses in the planning and conducting of the meeting.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0015, AERODYNAMIC FORCE AND MOMENT MODELING METHODS APPLICABLE TO PARAMETER EXTRACTION PROGRAMS USING BALLISTICS RANGE DATA
R.W. COURTER, Louisiana State Univ. Systems, School of Engineering, Mech & Industrial Engin, *University Station, Baton Rouge, Louisiana* 70803 (DF051330; AF-AFOSR-3489-78)

AF function - the reduction of ballistics range data to yield aerodynamic coefficients is a current problem at AFATL, Eglin AFB. Opportunity - new computational and data handling technology makes it feasible to extract much more information from the free flight ballistics range than in the past. Objective - to formulate a comprehensive plan for the systematic improvement of aerodynamic characteristics estimations from ballistics range data. How work contributes - this research will improve the versatility of the aerodynamic measurements of the AFATL ballistics range flights of aircraft and missile models having three unequal principle moments of inertia and having nonlinear aerodynamic responses.

Dynamic equations for inertial bodies lacking the usual symmetries will be analyzed and means devised for using them for range data interpretation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0016, SELECTED PROBLEMS IN SYSTEMS ENGINEERING
W.A. PORTER, Louisiana State Univ. Systems, Graduate School, *University Station, Baton Rouge, Louisiana* 70803 (DF050290; AF-AFOSR-3500-78)

AF function - to analyze, design and synthesize electronics systems and aerospace vehicles. Deficiency - complex system en-

gineering problems are continually encountered as a result of using system level approach to obtain maximum mission effectiveness in Air Force aerospace vehicles and support equipment, and as a result of integrating subsystem technology advances. Due to the complexity of the systems and of the appropriate theory available today, the problems are extremely difficult to solve. Objective - to improve the capability to handle these problems by providing a new and more powerful framework for engineering analysis and design. How work contributes - advances in the general theory of nonlinear operators will permit the design and construction of more powerful and cost-effective systems.

Research will continue into the diverse types of causality exhibited by models, into the class of systems represented by polynomic operators, and into the problem of approximating arbitrary causal systems by operators of a simpler type, such as polynomic.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0017, PHYSICAL DEFENSE AGAINST BIOLOGICAL ATTACK (REMOTE DETECTION OF BIOLOGICAL AEROSOL CLOUDS)

L.H. GRAF, U.S. Army, C B Detection & Alarms Div., *Aberdeen Proving Ground, Maryland* 21010 (DA0F0070)

Remote detection of biological threat aerosols for early implementation of defensive measures - development of logistically favorable biological detector with minimum need for refill and service kits.

Detection of biological aerosols by lidar through laser-UV excitation of biological fluorescence and optical sensing of the back fluorescence is being investigated as a remote detection concept.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Chemical Systems Lab.

4.0018, AIRCRAFT METHODOLOGY AND SENSITIVITY ANALYSIS

D.W. MOWRER, U.S. Army, Vulnerability Lethality Div., *Aberdeen Proving Ground, Maryland* 21005 (DA0P4484)

To identify the sensitivity of overall aircraft vulnerability estimates to the accuracy of the component vulnerabilities for different classes of aircraft targets and impacting projectiles.

Review data base on helicopters and other aircraft by system, subsystems and components and determine accuracy of estimates against various threats, based on available data.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Labs.

4.0019, AIRBORNE MULTI-SENSOR COASTAL RECONNAISSANCE SYSTEM

G.D. HICKMAN, Applied Science Technol. Inc., *19212 Plummer Dr., Germantown, Maryland* 20767 (DN675693; N00014-76-C-1042)

The objective of this project is to make a technical assessment of the current state-of-the-art and availability of remote sensors, the sensors' compatibility, and their compatibility relative to signal processors and display systems for a recommended airborne reconnaissance system.

A literature search will be made of system components to include imaging and non-imaging sensors, microcomputers, and communications systems. On-site reviews of sensor systems, signal processors and display systems in aircraft and ground stations will be conducted. Characteristics of the various sensor and data systems will then be analyzed and equipment performance and interface problems recognized. Recommendations will then be advanced for a basic compatible coastal reconnaissance system.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0020, COMMUNICATIONS - GAS LASER RESEARCH

A. JAVAN, Mass. Inst. of Technology, School of Science, Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DN723993; N00014-76-C-0447)

The objective of this work unit is to explore and understand those molecular processes which limit and determine the operation of molecular gas lasers with the goal of enhancing laser efficiency, laser power/energy and wavelength availability. Results of this research program will assist in obtaining an optimum design for infrared molecular lasers which are applicable to Navy requirements for optical reconnaissance, surveillance, communications, guidance, weaponry, fuzing, search and tracking.

Fluorescent emission from high lying electronic states in an excimer excited by a short pulse from a tunable dye laser is used to determine radiative lifetimes, excitation cross-sections and quenching rates. The technique of photopreionization, particularly through the use of low ionization seed gases, is being extended to the rare gas-halide laser systems.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0021, STUDY OF LASER CRYSTALS

A. LINZ, Mass. Inst. of Technology, Crystal Physics Laboratory, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DN524495; N00014-75-C-0395)

The Navy has a need for efficient blue-green lasers for imaging, communications, and surveillance type applications operating both in the air and under water.

The principal investigator is attempting to determine a crystal and dopant combination for maximum efficiency as a pulse compression laser operating in the q-spoiled mode. Promising candidates will be delivered to NRL for laser testing with a 0.1 joule pulsed dye laser as the pump source.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0022, COMPOSITE AIRFRAME REPAIR SYSTEM

R.C. DEITRICH, U.S. Navy, Air Engineering Center, *Lakehurst Naval Air Station, Lakehurst, New Jersey* 08733 (DN896005)

Define composite material repair systems/equipment requirements for the naval aviation maintenance environment.

Conduct literature/data bank search. Analyze maintenance repair operations. Establish level of repair parameters.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0023, FLIGHT DECK CONTROL WORK STATION

M. KOLODNER, U.S. Navy, Air Engineering Center, *Lakehurst Naval Air Station, Lakehurst, New Jersey* 08733 (DN796001)

A study will be made to improve the safety and efficiency of carrier aircraft handling operation by improving the capability and performance of aircraft handling officer (acho). Recommendations will be made for the design of equipments, controls, and displays and their arrangement and location within FDC.

It is planned to secure services of Human Factors Research, Inc. (HFR) who are expert in making studies of various work stations throughout carriers such as LSO, PRI-FLY, CATCC.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0024, ADVANCED ELECTRONIC FLIGHT CONTROL SYSTEM DEVELOPMENT (INTEGRATED SENSORY SUBSYSTEMS)

W.D. WEINSTEIN, Grumman Corporation, Aerospace Corp, *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN781387; N62269-76-R-0536)

To establish the conceptual design of an ISS (integrated sensory subsystem) suitable for the redundancy requirements of advanced V/STOL aircraft. This contract supports work unit ZA601, Agency Accession No. DN681080.

Determine the applicability of present day and state-of-the-art flight control sensors and estimation techniques to satisfy per-

formance, reliability, survivability, and maintainability requirements.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0025, TRANSONIC WING-BODY CALCULATIONS
A. JAMESON, New York University, Courant Inst. of Math. Scis., *251 Mercer St., New York, New York* 10012 (DN775079; N00014-77-C-0032)

The development of accurate methods for the prediction of the transonic flow fields about complex aircraft and missile configurations is essential for their design and optimization. The proposed research will develop finite-difference techniques for solving the complete potential equation for the transonic flow about three-dimensional configurations.

The development of accurate predictive techniques for increasingly complex configurations is an evolutionary one. The planned research will examine methods capable of extending the previous wing work of Jameson and Caughey to include the added complexity of a fuselage. The investigation will be conducted within the framework of the complete potential equation. The major effort will be devoted to the development of differencing procedures in conservation form.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0026, DEVICE HARDENING
W.M. SHEDD, U.S. Air Force, Rome Air Development Ctr., *Griffiss Air Force Base, Rome, New York* 13440 (DF903660)

The objective of this effort is to maximize the tolerance of semiconductor devices and integrated circuits to the radiation from both nuclear explosions and the natural space environment. This will be accomplished by maximizing the radiation resistance of devices and integrated circuits through the use of improved materials and processing techniques, new device designs, and hardened circuit design techniques. This effort is intended to provide the integrated circuit design and fabrication techniques for radiation-hardened electronics.

A radiation hardened CCD signal processor will be developed to demonstrate the ability of CCD devices to perform in a radiation environment up to the limits of available MOS technology. A program to develop an improved dielectric isolation technology for radiation hardened circuits will begin. Techniques will be developed for improving the area over which tightly controlled thickness for device pockets can be maintained. A study will be performed to determine the most promising technology for radiation hardened microprocessors. SMOS/SOS technology will be improved to obtain radiation-hardened LSI. Further work will be done to improve SOS technology to reduce back channel leakage currents, improve gate protection circuitry, and increase device yields.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0027, ADAPTIVE ANTENNA ARRAYS FOR AIRCRAFT COMMUNICATION
T. COMPTON, Ohio State University, School of Engineering, Electrical Engin, *190 N. Oval Dr., 102 Administration Bldg., Columbus, Ohio* 43212 (DN890051; N00019-78-C-0131)

The objective of this program is to investigate techniques for using adaptive antenna concepts appropriate for use in conventional airborne military communications systems to reduce or eliminate signal interference.

The research study on adaptive antennas will include (1) concepts for identifying single side band (SSB) and frequency shift keying (FSK) signals without increasing the bandwidth of the system, (2) techniques of frequency acquisition in adaptive arrays and (3) investigation of methods for phase tagging desired signals that do not produce significant envelope distortion.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0028, IMPACT ATTENUATION SYSTEM
W. WALCOTT, Beta Industries Incorporated, *2763 Culver Ave., Dayton, Ohio* 45429 (DN781273; N62269-72-C-0425)

To investigate and develop exploratory system configurations and techniques that will attenuate to a tolerable limit the vertical forces imposed by high-impact aircraft landings and crashes on pilots and aircrew men. This work is intended to increase the safety and survivability of aircrewmen in naval aircraft. This contract supports work unit ZA601, Agency Accession No. DN681080.

Exploratory development type hardware will be designed in accordance with previously established design criteria which takes into account body response, human tolerance criteria and E/A force-displacement wave form optimization. Vertical crash testing, simulating actual crash force loads and times will be conducted to evaluate performance and compare with analytical model prediction. Successful test data/model correlation will be followed by actual prototype development for an existing seating system for advanced development, test and evaluation for fleet use.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0029, BLUE TEAM SUPPORT FOR ECCM
E.W. MUSCHELL, U.S. Air Force, Avionics Laboratory, *Wright Patt. A.F.B., Dayton, Ohio* 45433 (DF110210)

The objective of this effort is to test low-cost ECCM fixes for the F-4. This encompasses ground and flight tests of both existing industry-supplied devices and in-house developed ECCM techniques.

Program will parallel previous efforts on coronet buzz and giant filter programs. In past, emphasis has been on integrating equipment already onboard in new ways. The F-4 has far fewer radar equipments to exploit in this manner. Thus emphasis will be on testing of contractor-supplied noise cancellation circuitry. Any industrial ECCM device tested on this effort must have previously undergone lab or field testing against a threat signal equivalent to spot or barrage noise jamming. Thus contract funds are intended to cover field testing, not development. Two testing phases are planned- a ground test of several candidate fixes with the F-4 radar installed in a tower facility, followed by flight test of the superior performers. A non-hardware contractor will be hired to operate and maintain the F-4 radar, provide simulated ECM signals and carry out test procedures established by AFAL. AFAL personnel will evaluate results of ground testing and select the most promising candidates for flight test. Flight testing will be performed at Nellis AFB or on other suitable location, following procedures similar to giant filter and coronet buzz tests, final product will be test data supplied to TAC and AFLC.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0030, RESEARCH ON DESIGN ANALYSIS FOR DUAL MODE AIR-LAUNCHED MISSILE SYSTEM (SUMMER FACULTY PROGRAM)
J.D. PINSON, Univ. of Dayton, School of Engineering, Mech Engin, *300 College Park Ave., Dayton, Ohio* 45409 (DF050540; F49620-78-C-0011)

AF function - weapons delivery, aerospace vehicles. Opportunity -incorporate state-of-the-art technology into an Air Force weapon system of enhanced mission effectivenss. Objective - to conduct a systems analysis and design study of a dual mode air-launched missile system for bomber aircraft, to promote awareness of Air Force technological problems among the engineering faculties of universities. How work contributes - the work will form the foundation for weapon system design choices by the aeronautical systems division, including technical feasibility, adequacy of available technology, mission effectiveness, operational feasibility. It will establish increased awareness of Air Force technological problems leading to possible future research contributions to the Air Force by engineering faculty members.

A university summer faculty design project will be conducted by the contractor at Wright-Patterson AFB/ASD, with cooperation of AFWAL and aerospace industry. In cooperation with the American Society for Engineering Education, 12 faculty mem-

bers will be selected, after nationwide advertisement, to participate in a 10-week intensive design effort. A senior investigator design engineer will be in immediate charge of the study. A 5-member technical steering committee of well-recognized experts will advise the program director and evaluate the work of the study. A final report will be submitted to the Air Force giving the full results obtained.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0031, LIVE CREWSTATION MOCK-UP AND DYNAMIC FLIGHT SIMULATOR

R.J. CROSBIE, U.S. Navy, Air Development Center, *Warminster, Pennsylvania* 18974 (DN881417)

To develop a generic dynamic crewstation capable of being efficiently inserted in the gondola of the NavAirDevCen centrifuge and used as a pilot controlled dynamic flight simulator for current and advanced aircraft. This development effort includes the design and fabrication of the necessary hardware required to accommodate advance cockpit/systems, e.g., displays, controls, seats, restraints, etc. It will also include the identification, refinement and verification of various software tasks required to control and operate the simulator. All directorates that use or may use dynamic simulation at NADC will be contributing to the development of this station.

This development effort will include the inputs of the Center's directorates as outlined in the background statement and includes the following tasks: (1) Design and building of physical cockpit will be a multiple directorate effort. (2) The development of the methods for the optimum simulator drive will use personnel and information from the Facilities (TSD) and the Life Sciences Division (ACSTD). (3) The aerodynamics will involve the Flying Qualities Branch of Aero Design and Propulsion Division (ACSTD). (4) The controls and force feels will include inputs from the Aircraft Systems Division (ACSTD). Displays and systems integration will be coordinated through the systems project director for AIDS and Systems Simulation Division (SD).

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0032, MOVING-BASE SIMULATOR, DRIVING FUNCTION

R.L. JONES, U.S. Navy, Air Development Center, *Warminster, Pennsylvania* 18974 (DN781378)

Technical objective - the overall objective of this task is to expand and enhance the expertise at NavAirDevCen in the area of simulating motion sensations of manned aircraft. Today's state-of-the-art motion systems are classified as either moving-base systems or sustained-force systems. A six-degree-of-freedom motion platform is an example of the former while a g-seat system or a manned centrifuge is classifed the latter. It is the objective of this task to investigate the driving functions for a moving-base system only. Specifically, this exploratory development program will investigate, develop and evaluate moving-base driving functions required to stimulate the human's motion and force sensory mechanism for simulating helicopter and V/STOL aircraft. Manned flight simulators are a major analytical tool for the Navy's research and development programs for aircraft and airborne weapon systems. Providing the pilot with realistic and accurate motion cues is both an essential and demanding task. This IED program will attack 'head-on' this task.

Approach - it is planned to first survey both the civilian and military branches of the flight simulation community for the state-of-the-art moving base drive techniques. The Air Force, NASA, and several airframe manufacturers are known to have ongoing research programs in this area. The next step will be to adapt these techniques to the NavAirDevCen simulation facilities and R and D mission. After the motion base drive functions/logic are implemented in the simulation laboratory, experienced pilots will be used to evaluate and optimize the drive functions. The resulting drive functions and techniques will then be documented.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0033, SCHEDULING FOR MULTIPROCESSOR SYSTEMS

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DESCRIPTION: Parallel and vector computer architectures are valuable for applications requiring high throughput on well-ordered data such as weather modelling, ballistic missile defense, air traffic control and econometric modelling. The advantage of parallel and vector architectures is the potential increase gained through concurrently executing independent portions of the same program. This work is directed towards the study of effective implementation of scheduling strategies for parallel computer architectures.

Emphasis will be toward bridging the gap between high-level languages and various scheduling strategies. Issues such as appropriate data structures and intermediate language constructs which facilitate scheduler implementations will be analyzed.

SUPPORTED BY University of Texas

4.0034, NAVY VEHICLE DESIGN AND CONSTRUCTION - LARGE DEFLECTION ELASTO-PLASTIC DYNAMIC ANALYSIS OF STIFFENED SHELLS OF REVOLUTION

J.A. STRICKLIN, Texas A & M University System, School of Engineering, Aerospace Engineering, *P.O. Box F E 44, College Station, Texas* 77843 (DN223171; N00014-76-C-0150)

Safe design of naval ships, aircraft, missiles, and submarines requires an understanding of the yield limits and dynamic/thermal response characteristics of complex structural systems. The objective of the proposed research is to develop a general purpose non-linear dynamic response computer code with thermal capabilities.

Isoparametric finite-elements and elements based on quadratic displacement functions will be used in the code. Large deflections, plasticity, and temperature-dependent material properties will be allowed. Solution procedures include the Houbolt, central difference, Newmark, and Park methods. The choice of the pseudo force formulation is based on efficiency as compared with other formulations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0035, STUDY OF RADIATIVE SCATTERING CONCEPT OF PLUME INFRARED RADIATION OBSCURATION

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AF function - this proposed research primarily falls in the 5.2 research objectives which deal with the reduction of detectability of aircraft exhaust plumes. The goals are to reduce the IR radiation by 95 percent and to obtain better spectral models for the IR radiation of exhaust gas constituents, and to determine the influence of additives, including the effect of minor chemical species and aerosols on modifying the electron concentration and the visible and IR radiation patterns. Deficiency - realistic models of the jet exhaust plume, including the effect of putting aerosols around the plume are needed in order to reduce the detectability of aircraft in a hostile environment. Work is needed both from experimental and theoretical sides so that reasonable progress can be made in this area. Objective - the technique that is proposed is to employ an aerosol suspension of solid particles or liquid drops which will increase the scattering path length thus enhancing the potential for photon absorption. An experimental study is proposed to evaluate this absorption scattering concept for carbon particles and for liquid aerosols and to select candidate materials for system applications. A theoretical program is also proposed to develop a numerical code to calculate the radiative transfer for a plume/shroud geometry. Contribution - this is one of three proposals to look into this area. This is a joint AFAL and AFOSR project.

Work will be performed by Utah State Univ. and the Chemistry and Physics Lab. of the Aerospace Corporation to find gas vapors which possess absorption features at the primary infrared wavelengths emitted by jet aircraft plumes. Vapors such as N2O and methylisothiocyanate for the 4.6 microns CO2 band wing and formic acid for the 2.9 microns H2O/CO2 band wing have proved

effective in the obscuration of the infrared radiation. Preliminary estimates of the amounts of these materials required to form a shroud around a typical aircraft plume to provide 90 percent reduction of the intensity for a period of about 10 seconds indicates the concept is feasible but possibly marginal. The relative simplicity of this obscuration concept indicates that efforts should be made to increase its effectiveness. The technique that is proposed is to employ an aerosol suspension of solid particles or liquid drops which will increase the scattering path length thus enhancing the potenti (Text Truncated - Exceeds Capacity)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0036, TARGET SIGNATURES APPLICATION TO TACTICAL TARGET IDENTIFICATION

N. BROSTE, General Research Corporation, *7655 Old Springhouse Rd., McLean, Virginia* 22101 (DF911140; F30602-78-C-0041)

The objective of this effort is to provide a unified simulation capability consisting of target signatures, scenario environment, sensor, signal processing, and identification algorithms which will permit variation in engagement, system parameters and alternative signal processing techniques. In particular, the program will include the development of a target signature data base for tactical target identification concepts and demonstration of its use for evaluation of tactical target identification (TTI) classification algorithms.

The approach is based on a survey of wide band signature data and development of at least three target models based on the data, assessment of current wideband systems capabilities and subsequent modification of the target models to correspond to these systems and selection of basic classification algorithms to identify target type, stores, orientation and special equipments. The classifiers shall include both noise and statistical measurement factors. Interfaces to both target-sensor models and display graphics shall be adequately automated to permit parametric performance assessments. This program addresses the problem of classification and identification of non-cooperative aircraft through the use of high-resolution techniques. In particular this effort addresses the key areas of simulation, concept development and parametric evaluation of tactical target signatures. Existing tactical radars are unable to perform positive identification for non-cooperative targets. This deficiency has been expressed in revised TN-ESD-AFCRL-RADC 1709-69-07 (Aircraft Identification Technology) May 1974. In addition, an ESD publication C3 Deficiencies and Development Proposals, an ESD view, and tactical Air Force initiative 5-76 have proclaimed that the USAF's ability to discriminate among friendly, enemy and neutral aircraft is inadequate.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0037, UNIVERSAL WIDE BAND RECORDER

M. FIVEL, Isomet Corporation, *5263 Port Royal Rd., Springfield, Virginia* 22151 (DN581147; N62269-75-C-0109)

A universal wide band recorder is being developed for airborne use to record sensor imagery from electrooptical sensors. This contract supports work unit ZT701, Agency Accession No. 681263.

Approach - a CPFF contract has been let to develop the recorder. Additional funds were provided to cover the cost overruns on the contract.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, LUNAR DATA SYNTHESIS - LUNAR BASINS

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The work plan for Fiscal Year 1978 includes the following tasks: (1) Complete cartographic maps in basin-centered polar stereographic format for the Orientale and Caloris basins; (2) Compile and publish geologic maps on the basin-centered bases of item 1; (3) Collect and analyze existing geometric measurements for 575 terrestrial volcanic edifices to develop scaling models to predict the geomorphology of similar features on other terrestrial planets: (4) Develop scaling criteria for secondary impact craters on the Moon over diameter range of .5 to 35 km; (5) Compare numerical continuum mechanics model results with field observations for Meteor Crater in Arizona.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0002, PLANETARY RESEARCH

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The major divisions of Planetary Research in FY 1978 will be (1) Planetary Data Analysis and (2) Geologic Support for Planetary Missions. The overall objectives and goals of the project will be the reduction of photographic data received from planetary probes to geologic maps of the surfaces of the planets and to investigate geologic features and processes that are of special importance in the shaping of planetary surfaces and to provide geologic support for future planetary missions and to increase the interpretability of available planetary data by conducting selective experimental and terrestrial geologic studies. The approach may vary as mission schedules and goals change along with the state of understanding of planetary surface processes.

The major tasks during FY 1978, some of which are continuations of last year's work, under the general headings will be: (1) Geologic mapping of Mars (D.H. Scott); (2) Geologic application of Mars radar data (G.G. Schaber); (3) Aeolian processes (J.F. McCauley); (4) Mass wasting and periglacial processes (B.K. Lucchita); (5) Inventory and classification of Martian landforms (J.F. McCauley); (6) Mars data synthesis (L.A. Soderblom); (7) Fluvial history of Mars (M.H. Carr); (8) Martian volcanic processes (H.J. Moore); (9) Mars chronology (C. Condit); (10) Lunar and planetary program support (M.H. Carr); (11) Lunar and planetary data facility (E.C. Morris).

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0003, DEPARTMENT OF DEFENSE CRATERING MECHANICS

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Geologic studies of natural hypervelocity impact craters and experimental explosion craters formed by detonation of nuclear devices TNT hemispheres and spheres partly buried and tangent to alluvial and hard-rock surfaces are being completed (a) to assist in interpretation of structural analogs found in large natural terrestrial, lunar and Martian and Mercury impact craters; (b) to aid in the interpretation of cratering processes caused by very-high-energy shock waves; (c) to provide a basis for the physical interpretation of the P-T environment of shock metamorphosed material from impact craters; (d) to describe the mechanics of central uplift, rim structure, breccia lens, overturned flap and ejecta formation; and (e) to define the important cratering differences between high-density and low-density impacting bodies. This work is directed to a general study of hypervelocity impact high-explosive and nuclear cratering processes and the impact modification of planetary surfaces and crust. The interpretation of cratering processes and mechanics determined from these studies of large natural and experimental craters is also being directed towards man-made large-scale engineering applications of cratering.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0004, DYNAMICS AND MICROPHYSICS OF STABLE OROGRAPHIC CAP CLOUDS - COMPARISON BETWEEN THEORY AND OBSERVATION

K.C. YOUNG, Univ. of Arizona, Inst. of Atmospheric Physics, *Tucson, Arizona* 85721 (ATM77-04287)

The objectives of this research are two-fold; namely, model development and model verification. Two types of models will be developed. A three-dimensional, dynamical model will be developed in order to describe the flow field over and around Elk Mountain to be used as input into the microphysical model. A three-dimensional, microphysical model will be developed based on an existing two-dimensional model of orographic precipitation. The models will be restricted to cases where the flow within the cap cloud is stable and reasonably steady-state.

Model verification will be undertaken in two stages. First, aircraft observations of the thermodynamic variables and winds will be used in verification of the dynamical model. If the agreement between the model predictions and the observations is felt to be deficient, the observations will be used to improve the predicted flow field.

The predictions of the microphysical model will be compared to airborne and ground-based microphysical observations. Comparisons will emphasize the types and sizes of particles and the precipitation rate at the ground.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0005, AREAL SLOPE STABILITY ANALYSIS, SAN FRANCISCO BAY REGION

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STATE TO WHICH PROJECT PERTAINS: California.

The objective of this project in FY 1978 is to complete research on an experimental method for rapid reconnaissance mapping of slope stability. The method uses differences in the topographic form of hillside terrane as seen in high-altitude aerial photographs to map the landslide processes at work on the slopes. The product exemplifying the approach will be a reconnaissance map at 1:62,500 of slope stability of the Franciscan terrane that makes up most of Marin County, California. Preparation of this map will require completion of detailed mapping of bedrock, surficial mantle and landslide features in four calibration areas, each 2 to 10 square km, located in representative portions of the various topographic units that have been mapped from 1:80,000 aerial photographs. Models of landslide processes will be developed for each topographic unit from the detailed studies, the models to describe the kinds of slides present, their abundance, their habitat within the topography, their activity, rate of movement, timing of movement with respect to rainfall, and appropriate engineering solutions to the hazards posed.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0006, YUKON-TANANA

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STATE TO WHICH PROJECT PERTAINS: Alaska.

Project plans for the Big Delta quadrangle are to: 1) Compile a preliminary reconnaissance geologic map at a scale of 1:250,000. 2) Complete analyses of geochemical samples and compile geochemical maps at scale of 1:500,000 and 1:250,000. 3) Prepare an aeromagnetic interpretation. 4) Prepare interpretations of the LANDSAT imagery. 5) Prepare a mineral resource assessment map.

Reconnaissance geologic mapping will be commenced in the Circle quadrangle in the summer of 1978.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0007, REMOTE-SENSING DETECTION OF PERCHED WATER - A PILOT STUDY

J.E. ESTES, Univ. of California, School of Letters & Science, Geography, *Santa Barbara, California* 93106 (B-181-CAL)

PROBLEM: Kern County, California, and other western regions will face significant agricultural land losses in the near future if brackish, perched tables are not inventoried and properly managed. At present, water resource managers can acquire dynamic perched water information only through extensive, costly well-drilling programs.

RESEARCH CONTRIBUTIONS: This proposed research, if successful, will greatly reduce the need for these unsatisfactory, and too infrequent terrestrial surveys.

RESEARCH OBJECTIVES & APPROACH: It is the specific objective of this proposed research to investigate the following airborne sensor systems, i.e. photographic (.4-1.1 microns), thermal infrared (8-14 microns), passive microwave (.1-25 microns), and active microwave (L-band; 20 cm), to determine their efficacy in providing timely, spatially accurate, and cost-effective perched water information. In conjunction with the proposed overflights of two test sites in Kern County, intensive ground investigations will be conducted to determine the optimum remote sensor/ground investigation configuration for identifying near-surface perched water.

USER-AGENCY INTERFACE: If successful, the optimum system configuration will receive further research in the study area and the technology transferred to the Kern County Water Agency for operational implementation. Meanwhile, the data generated by this research will be input to the KCWA groundwater hydrology model to assess the degree to which remotely sensed perched water information may aid the operation of the model.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0008, SEASAT

L. FEDOR, U.S. Dept. of Commerce, Environmental Research Labs., *Boulder, Colorado* 80302 (8B326351)

PROJECT OBJECTIVE: 1. To develop and test techniques for measurement of sea state using the satellite altimeter. 2. To assist in analysis and interpretation of real and synthetic aperture images of ocean waves as they impact on the SEASAT instrument.

CURRENT YEAR PLAN: Verify algorithms on initial data from the SEASAT-A altimeter. 2. Study effect of large-scale surface features on radar pulse returns and estimates of sea state especially in regions of strong surface currents. 3. Comparison of significant wave height determinations with surface truths especially for tracking of severe storms. 4. To develop and analyze techniques for interpretation of imagery radar wave records. 5. To participate in SEASAT committees, workshops, and joint experiments with AOML.

PROGRESS REPORT: Successful completion of algorithm development. Altimeter measurement workshop to be held in Boulder 2/27 through 3/ 3/78, to intercompare algorithms and develop standards to be applied to SEASAT-A altimeters.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0009, NATIONAL AEROMAGNETIC SURVEY

R.H. GODSON, U.S. Dept. of The Interior, Geological Survey, Geologic Division, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9730-00352)

The project will continue to update publication lists by state of aeromagnetic and aeroradioactivity maps and reports. Administration and monitoring of new contracts to private industry for airborne surveys will continue.

Principal facts of completed airborne surveys will be systematically gathered for eventual computer input.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0010, REMOTE SENSING FOR URANIUM EXPLORATION

G.L. RAINES, U.S. Dept. of The Interior, Geological Survey, Geologic Div, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9790-01706)

STATES TO WHICH PROJECT PERTAINS: Wyoming and Utah.

Evaluation of remote-sensing methods in the search for uranium deposits, including definition and demonstration of specific uses and limitations of the methods. Improvement of data gathering and interpretation techniques. Acquisition of data on spectral reflectance and thermal character of target materials as a data base from which to refine remote sensing as an exploration tool.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0011, HIGH-FREQUENCY ELECTROMAGNETIC TECHNIQUES

R.D. WATTS, U.S. Dept. of The Interior, Geological Survey, Geologic Division, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9780-01756)

STATE TO WHICH PROJECT PERTAINS: Utah.

Radio-frequency electromagnetic methods will be used to study the geometry and homogeneity of salt (halite) deposits in the Paradox Basin of Utah. Radio methods have been used successfully to determine the size of water-filled voids in glaciers. The same techniques will be tried in salt. Access to the Paradox Basin salt deposits will be by boreholes only, so compact radio instrumentation will be designed and constructed.

An analysis of EM scattering from buried pipes, wires, and rails will be carried out. Emphasis will be on finite-length structures buried in a realistic model of the earth. Investigations will be theoretical and computational.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0012, REMOTE OCEAN SUBSURFACE TEMPERATURE PROFILER (ROSTEP)

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To determine the feasibility of remotely measuring open ocean subsurface temperature profiles. These measurements will provide quantitative data on air-sea energy exchanges which support meteorological and oceanographic prediction models and also as inputs for sound velocity calculations to predict performance of tactical and strategic acoustics weapons systems. The fundamental problem is to develop a remote sensing capability that measures temperatures below the surface of the ocean.

Utilizing the fact that the Raman spectrum centroid shifts with the temperature of the medium, conduct a system analysis for establishing system parameters of a model laser sensor in the visible region for operational measurement of subsurface ocean temperature profiles. Utilize data from field measurements with the feasibility model sensor to define performance parameters for operational systems to meet Navy measurement requirements.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0013, THE FORMATION AND DISTRIBUTION OF WHITECAPS PRODUCED BY BREAKING WAVES ON THE OCEAN SURFACE

R.L. SNYDER, Nova University, Physical Oceanographic Lab., Oceanography, *800 N. Ocean Dr., Dania, Florida* 33004 (OCE76-10739 A01)

This project will study the formation and properties of whitecaps (foam) produced by the spontaneous breaking of surface waves. Photographs of the formation and growth of whitecaps have been collected for a variety of wind conditions at an instrumented tripod in the Bight of Abaco near Grand Bahama Island. The photographs will be scanned to determine the size, growth, and frequency of occurrence of the whitecaps. These properties will then be related to wind speed and direction and wave speed and direction. Attempts will be made to determine the criteria governing the formation of whitecaps. Understanding whitecapping is very important (a) to understanding energy dissipation by the breaking of surface waves, and (b) to interpreting data from remote sensing instruments mounted on aircraft or satellites. For example, instruments employing microwave-scattering techniques are very sensitive to the percentage of the sea surface containing foam. This project will give the desired high priority to analyzing the whitecap data.

SUPPORTED BY U.S. National Science Foundation, Div. of Ocean Sciences ,

5.0014, MANGANESE RESOURCES

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OBJECTIVES: The objectives for the final year of this project are: 1. To complete bulk chemical analysis of the collected ferromanganese deposits for nickel, cobalt, copper, titanium, iron, and manganese by energy dispersive x-ray and atomic absorption analysis. 2. To complete chemical analysis of leachable portions of ferromanganese deposits. 3. To complete examination of the morphology, structure, mineralogy, and chemistry of ferromanganese in contrast with deposits from deep sea environments to determine the factors influencing nodule growth. 4. To publish a final report on research results of this 3-year project.

HOW INFORMATION WILL BE APPLIED: The information obtained from this research effort will be transmitted to the State Legislature, the Governor's office, State Departments of Land and Natural Resources and Planning and Economic Development, and the State Attorney General to provide them with the necessary data upon which to formulate state policies which will guide Hawaii's present and future role in mining the ocean. As data become available, industry will be given the data to enable them to formulate directions for development. To keep scientists informed of the state-of-the-art, the scientific community will be continuously apprised of findings. Interested federal agencies and the U.S. House of Representatives Subcommittee on Mines and Mining will be sent information as it becomes available.

ACCOMPLISHMENTS DURING PAST TWELVE MONTHS: 1. A cruise was conducted to Waho Shelf where 10 dredge sites and 4 camera stations were sampled. 2. An x-ray radiographic technique for studying the internal morphology of manganese nodules was developed. 3. The qualitative mineralogy of Waho Shelf nodules and ferromanganese crusts was determined. 4. It was determined that previously reported high concentrations of noble metals in Hawaiian deposits were in error. 5. Preliminary data indicating possible economic potential of Co and TiO2 in Hawaiian deposits were obtained. 6. Several papers concerning the scientific and economic aspects of Hawaiian deposits are now in progress.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Sea Grant Office

5.0015, WORLD GEOID BY DENSITY LAYER METHOD

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The determination of the Earth's gravitational field is being attempted by this laboratory by employing the density layer method, in which the anomalous potential is considered as being condensed into a simple layer of varying density over the surface of the reference figure. This approach has the advantages of easier geographic and geophysical correlation with physical reality than the spherical harmonic representation, is simpler computationally than the gravity anomaly representation, and capable of generalization and deeper analysis because it is directly tied in with the basic boundary value problem of geodesy.

Technical objective is to improve description of the figure of the Earth and its gravity field, to apply this technique to other planetary bodies, and to conduct geophysical correlation studies in order to identify structural and density variations in the Earth's crust and mantle.

Although the density layer method conceptually involves a layer of continuously varying density over the Earth's surface, in practice, computation and evaluation must be carried out by discrete methods, that is, breaking the surface up into blocks, over each of which the layer is either constant or follows a law holding for that particular block. Various methods will be tried, both analytical and numerical, in order to obtain the best possible accuracy for the most efficient computer time. Since computer time can be extremely large in these computations, a large part of the effort will go into optimizing programs.

Data sources employed up to now have been satellite optical and Doppler observations, and ground gravimetry. A new data source, altimetry, has been introduced into the analysis. The geophysical correlation studies will be based on both statistical methods, and on physical model building. Relations between the density layer and other representations have been developed, in order to readily transform from one system to the other, depending on the type of data at hand, and the mode of presentation desired. NOAA Technical Report NOS 67 NGS 3 describes mathematical algorithms for computing attractions caused by a simple density layer.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Ocean Survey

5.0016, LASER HYDROGRAPHY DEVELOPMENT

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OBJECTIVE: Validation of the capability of an airborne laser system to meet the vertical requirements of NOS, and determination of the cost effectiveness and associated optimum prototype system configuration which best meets NOS' requirements.

APPROACH: The first objective will be addressed by field testing the NASA Airborne Oceanographic Lidar as an 'engineering model' laser depth sounder. The second objective will be met by doing a conceptual design and performing a cost-benefit analysis to determine cost per unit area of airborne hydrography.

PROGRESS: The project to date has progressed through 95 percent of the field testing. The preliminary data analysis is now being done with final reporting scheduled for March 1978.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Ocean Survey

5.0017, NATIONAL WEATHER SERVICE - EXPLORATORY INSTRUMENTATION

M.J. SANDERS, U.S. Dept. of Commerce, Equipment Development Lab., *Silver Spring, Maryland* 20910 (8AA8103)

TECHNICAL OBJECTIVE: To develop, test and evaluate new instrumentation which uses advances in sensor and processor technology.

APPROACH: (1) Determine the feasibility of the 'infrared stereo radiometer' concept in estimating cloud height and amount. (2) Develop a pattern recognition machine which automatically classifies laser 'present weather' signatures. (3) Develop a no-moving-parts anemometer. (4) Develop a Radio-Acoustic Sounding System (RASS) for radiosonde applications.

PROGRESS: Primary emphasis in the development of next-generation sensors has been on sensor and sensor systems geared towards automating manual observations. An 'Infrared (IR) Stereo Radiometer System' and a 'Laser Present Weather Identifier' are products of this emphasis. Efforts have also continued on the development of no-moving-parts anemometers and a 'Radio-Acoustic Sounding System (RASS)' for radiosonde applications. 1. Infrared (IR) Stereo Radiometer: An Infrared Stereo Radiometer experimental system was developed (by contract) to an EDL specification during FY1977. The system was recently installed at the T&ED's Research and Development Center in Sterling, Va. 2. Laser Present Weather Identifier: The first effort towards automating the observation of present weather was the evaluation of a 'Laser Present Weather Identifier' experiment, designed by NOAA's Wave Propagation Laboratory. Two candidate Laser Precipitation Yes/No Processors designed and built in FY1977 are being evaluated. 3. No-Moving-Parts Anemometers: During FY1977 a design analysis program on no-moving-parts anemometers was conducted, and found that none was suitable to replace the NWS anemometers and meet the accuracy goals for speed and for direction. 4. Radio-Acoustic Sounding System (RASS): The Radio-Acoustic Sounding System (RASS) concept is based on the fact that since the speed of sound is proportional to the square root of the absolute temperature, it is possible to develop real-time temperature profiles using RASS. Two problems have been outstanding: (1) the size of the equipment, and (2) the maximum altitude (range) is very sensitive to the wind field along the path. EDL and Stanford Research Institute participated in a experiment to resolve these problems. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service

5.0018, DEVELOP INSTRUMENTATION AND TECHNIQUES FOR STRATOSPHERIC ION COMPOSITION MEASUREMENTS

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AF function - military operations of supersonic aircraft and other vehicles in the stratosphere. Deficiency - the environmental effects of AF stratospheric operations cannot be accurately predicted for lack of knowledge of normal species concentrations and their spatial and temporal variations. Further, the mixing and properties and chemical interactions of jet engines or missile effluents are only poorly defined. Objective - develop and flight test a viable balloon-borne mass spectrometer system and techniques to determine the ionic composition and electro-chemistry of the stratosphere, and conduct an initial measurements effect. How research contributes - ions may be effective sinks for pollutants by serving as condensation nuclei which could agglomerate stratospheric pollutants, forming aerosols which subsequently fall from the stratosphere into the troposphere to be washed out. Payoff could lessen restrictions on Air Force operations.

A cryopumped ion mass spectrometer will be designed and developed for balloon-borne measurements of positive and negative ions under both ambient and artificially excited conditions. Extensive laboratory evaluation testing will be conducted including laboratory experiments with cluster ions to identify change transfer reactions that alter the ion composition of the stratosphere. A theoretical study of ambient ion masses will be made to guide programming of the ion mass spectrometer measurements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0019, CLOUD ANALYSES FROM DMSP IMAGERY

J.T. BUNTING, U.S. Air Force, Geophysics Laboratory, *L.G. Hanscom A.F.B., L.G. Hanscom A.F.B., Bedford, Massachusetts* 01730 (DF581490)

AF function - weather observing, analysis and forecasting for military operations. Deficiency - lack of adequate information to meet military weather support requirements. Objectives - to evaluate methods for estimating cloud information from satellite imagery and to develop an improved data processing plan for use in the AFGWC 3-dimensional nephanalysis. How development contributes - makes possible the real-time use of high-resolution satellite imagery in operational analysis and forecasting to satisfy requirements of AWS TN 2-75.

Under IHWU 86281202 (terminated for administrative purposes) several interrelated techniques were identified which offer potential improvement in extracting cloud information from high-resolution satellite imagery. These techniques will be developed in order that improved automated processing procedures can be presented to AFGWC for use in the 3-dimensional nephanalysis program. These techniques include discrimination of cloud type based on Fourier analyses, bit-reduction algorithms to compress images to reduce computer requirements and application of multispectral data to obtain information on cloud structure, cloud phase and precipitation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0020, RESPONSE OF THE ATMOSPHERE TO NEUTRAL AND PLASMA TURBULENCE

T.J. KENESHEA, U.S. Air Force, Geophysics Laboratory, *L.G. Hanscom A.F.B., L.G. Hanscom A.F.B., Bedford, Massachusetts* 01730 (DF581240)

AF function - communications and satellite surveillance. Deficiency - inadequate knowledge of the atmosphere, particularly for determining the effects of natural or man-made disturbances. Objective -to measure turbulent and laminar transport coefficients in the upper atmosphere and to develop improved theoretical model atmosphere of neutral and ionic composition. How research contributes - following solar proton events and nuclear detonations, radio communications are interrupted and missiles and satellites are lost from radar view. Improved models that can predict ionospheric perturbation effects can aid in the improvement of communications and tracking of vehicles. Improved models of the neutral atmosphere will result in more accurate predictions of system satellite ephemerides.

In order to describe more properly the dynamics of the mean mass motion of the atmosphere, as well as the individual species distributions, it is necessary to take into consideration interactions due to neutral and plasma turbulence. To accomplish this, the single static equation presently being used to describe the turbulent velocity will be abandoned and the turbulence term will be inserted directly into the existing equations of motion. The molecular and turbulent velocities will no longer be separable and the solutions will yield the total specific velocity of each species under the influence of these forces. To observe the effects of neutral and plasma turbulence on the mean mass motion and the individual species distributions, the modified mathematical approach for incorporating turbulence into the equations of motion will be inserted into an existing computer model that already contains photon reactions as well as electron precipitation and the thermal response to density and mean mass motion oscillations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0021, SNOW/CLOUD DISCRIMINATION SENSOR DESIGN

F.R. VALOVCIN, U.S. Air Force, Geophysics Laboratory, *L.G. Hanscom A.F.B., L.G. Hanscom A.F.B., Bedford, Massachusetts* 01730 (DF580320)

AF function - weather analysis and forecasting for military operations. Deficiency - lack of adequate information to meet military weather support requirements. Objective - to recommend an optimum snow/cloud sensor design to AWS/SAMSO/DMSP to discriminate clouds and snow background. How development contributes - provides an efficient and an ambiguous operational procedure for distinguishing clouds from snow backgrounds as well as distinguishing ice clouds from water clouds.

Based on the analysis of the optical physics KC-135 collected snow/cloud measurements and the experimental sensor above DMSP, reduction and analysis procedures for a recommended snow/cloud discrimination instrument will be formulated. A recommendation for an optimum operational instrument will be made with regards to the near IR band, bandwidth, viewing geometrics and related data processing procedures.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0022, AURORAL E LAYER

R.A. WAGNER, U.S. Air Force, Geophysics Laboratory, *L.G. Hanscom A.F.B., L.G. Hanscom A.F.B., Bedford, Massachusetts* 01730 (DF580970)

AF function - HF radio wave communication, OTH radar system. Deficiency - variability of auroral e-layer leads to impairment of propagation characteristics of this e-layer mode. Objective - mapping of circumpolar auroral e-layer as function of magnetic activity. How research contributes - understanding of auroral e-layer characteristics will assist providing improvement of operation of HF communication and radar systems through polar regions.

Airborne noon sector ionospheric auroral e-layer data and simultaneously acquired satellite particle and ground-based ionospheric data will be analyzed to determine the temporal and spatial characteristics of the circum-oval auroral e-layer. This case study, limited to several days in 1968, 1969, and 1971, combined with recently completed night sector studies will provide a baseline for understanding the dynamics of the circumpolar e-layer. With this background, data taken during IGY (1957-1958) will be considered because the IGY was a high sunspot period and because of the large number of ionospheric stations during that period. Ionograms will be selected from stations representative of auroral zone and polar cap areas. These ionograms will be scaled to provide FOEA and H'EA, and also FBES, H'ES and FMIN. As a first step, periods of moderately high magnetic activity will be considered in order to determine if an auroral e-layer existed in much or all of the polar cap during such time. If such a polar cap or a 'mantle' e-layer did exist, the analysis will be expanded to include a complete data base. The end result will be to produce maps of e-layer parameters for the northern hemisphere as a function of magnetic activity.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0023, DETECTION OF MAPLE DECLINE BY REMOTE SENSING

H.L. MORTON, Univ. of Michigan, School of Natural Resources, Mcintire Stennis Program, *Ann Arbor, Michigan* 48104 (0072735; MICY00041)

OBJECTIVE: Determine the feasibility of aerial detection of maple decline in an urban area, the degree of symptom progression required for aerial detection, and the optimum scale and film type.

APPROACH: The city of Ann Arbor will be photographed on two film types and at four scales. Ten interpreters each will evaluate maple decline in 100 preselected (on which data have been collected) trees falling into five disease classes.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Michigan

5.0024, APPLICATION OF ERTS DATA TO INVENTORY OF WATER AND ASSOCIATED LAND RESOURCES IN GARRISON/DEVIL'S LAKE REGION, NORTH DAKOTA

R.D. MOWER, Univ. of North Dakota, School of Arts & Sciences, Geography, *University Station, Grand Forks, North Dakota* 58201 (A-047-NDAK)

Following the launch of ERTS-1 in July, 1972, an extremely large data source soon became available to those engaged in resource management and research. Although the feasibility of using these data has been conclusively demonstrated in numerous studies elsewhere, their use for determining the quality, extent, and distribution of water and associated land resources in the Garrison/Devil's Lake Region of North Dakota has not yet been proven. The purpose of this study is to determine if the use of ERTS data is feasible for water-related studies in the North Dakota milieu. To accomplish this task, tests will be conducted to determine if water and associated land-resource categories depicted on image mosaics produced by a Mead Digital Graphics Generator (DGG) system from ERTS data correlate with ground-truth data acquired by field crews for selected test sites. If a high degree of correlation is found between resource categories depicted on the ERTS mosaic and at the field test sites, then detailed mapping of the entire Garrison/Devil's Lake Region will be accomplished using the DGG system.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0025, DEVELOPMENT OF LINEAR MODELS FOR ANALYSIS OF REMOTELY SENSED DATA FOR FOREST LAND CHARACTERISTICS

F.T. BORDEN, Penn. State University, School of For. Resources, *102 Ferguson Bldg., University Park, Pennsylvania* 16802 (0071500; PEN02285)

OBJECTIVE: Develop and apply discriminant functions from specific linear models to differention among forest land categories in remotely sensed data.

APPROACH: Specific linear models incorporating orthogonal contrasts among forest land categories will be designed and extended into canonical form for discrimination. Programming will be done in the Office of Remote Sensing of Earth Resources data processing system. Maps and color displays will be generated for comparative interpretation of the methods with other commonly used methods.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Pennsylvania

5.0026, REMOTE OPTICAL SENSING OF OCEAN UPPER LAYER TEMPERATURE

K. PETRI, U.S. Navy, Air Development Center, *Warminster, Pennsylvania* 18974 (DN881009)

To investigate the feasibility of measuring ocean surface and subsurface temperatures remotely with a laser radar. An airborne laser radar that could remotely sense ocean temperatures would be used to plot maps of ocean temperatures. Variations in ocean temperatures are important in predicting acoustic data propagation for ASW applications. Prediction in ocean waves from measurement of surface temperature could improve fleet operations without the need for BT and XBT measurements.

A laser radar including Raman shift techniques for sensing temperatures remotely will be developed under contract. Previous programs have demonstrated feasibility in a laboratory environment. The laser radar will be suitable for installation in a P-3C aircraft for flight-test evaluation.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0027, MODEL DEVELOPMENT FOR PREDICTING SOIL MOISTURE BY THERMOGRAPHY

J.A. TUNHEIM, South Dakota State University, School of Engineering, Physics, *Brookings, South Dakota* 57006 (A-063-SD)

The proposed research involves theoretical and experimental investigations relating to the measurement of near-surface soil moisture by the use of remote sensed thermal emittance. The general approach is to modify and use a heat flow model to calculate soil moisture differences from surface temperature deviations caused by the change in soil thermal properties with moisture content.

Field investigations will include the measurement of soil temperature profiles during the diurnal cycle together with soil moisture and thermal emittance. These measurements will be made on irrigated plots with several types of crop cover to delineate the role of the crop canopy in altering temperature patterns during nighttime hours. The temperature and soil moisture data will then be used to calculate parameters in the model needed to predict thermal emittance. Application of the model developed in this project will then be made to the interpretation of thermal data from earth resources satellites. Recommendations will be made pertaining to the use of thermal emittance data in irrigation scheduling.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0028, AERIAL PHOTOGRAPHIC STAND CLASSIFICATION FOR SILVICULTURAL MANAGEMENT OF THE SOUTHERN PINE BEETLE

G.N. MASON, Stephen F. Austin State Univ., School of Forestry, Mcintire Stennis Program, *Nacogdoches, Texas* 75961 (0072114; TEXY00026)

OBJECTIVE: Adapt photo inventory techniques to rate pine stand susceptibility to southern pine beetle attack. Establish the utility of existing space and aircraft imagery in site-stand analysis. Assign susceptibility class to specific stands and test reliability of harzard rating models.

APPROACH: Will be accomplished through milti-level sampling with space and aircraft imagery with 35 mm low level supplement. Resulting stand maps will be integrated with existing ground and infestation data to establish and test a hazard rating system.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Texas

5.0029, REMOTE SENSING IN AGRICULTURE

N.L. POWELL, Virginia Poly. Inst. & St. U., School of Agric. & Life Sci., Agronomy, *Burruss Hall, Blacksburg, Virginia* 24061 (0065075; VA-0312724)

OBJECTIVE: Use multi-spectral sensing techniques to identify plant canopies of various stages of development, determine plant vigor, evaluate plant communities for effects of plant stress, determine the optimum wavelength regions for specific signatures of crop and soil conditions, utilize data processing devices, including computer software, analyze data and provide appropriate maps and other results, develop a system of remote sensing useful for agriculture.

APPROACH: Utilizing aerial platforms, remote sensing overflights with camera and multi-band sensor systems will be conducted on controlled agricultural experiment stations and farms in the Chesapeake Bay region. Detailed ground truth data of soil and crop parameters will be correlated with the multi-spectral imagery.

PROGRESS: False color infrared aerial imagery was collected over most of the peanut growing region and a small part of the tobacco growing region of Virginia. Results of photo-interpretation of the imagery and follow-up ground studies indicate that a combination of the two procedures can be used effectively to determine disease losses in tobacco and soybean fields as well as in peanut fields. Sting nematode and red crown rot (Cylindrocladium crotalariae) of soybeans, cyst nematode in tobacco, and Cylindrocladium black rot (Cylindrocladium crotalariae) and sclerotinia blight (Sclerotinia sclerotiorum) of peanuts were the major diseases observed. An evaluation of the imagery of the peanut growing region for three growing seasons (1974, 1975, and 1976) indicates that Cylindrocladium black rot disease of peanuts is spreading rapidly and is not affected greatly by environmental conditions. Sclerotinia blight of peanuts caused slight to moderate infections in 1974, very slight infections in 1975, and moderate to severe infections in 1976. This indicates that environmental conditions play an important role in the development of this disease during the growing season. Temperature and relative humidity data were collected in the peanut growing area to determine if the Jensen-Boyle Cercospora leafspot model for peanuts was valid for Virginia conditions.

SUPPORTED BY Virginia State Government

5.0030, UTILIZATION OF SATELLITE AND RADAR DATA IN SHORT-RANGE PRECIPITATION PREDICTION MODELS

D.D. HOUGHTON, Univ. of Wisconsin, School of Letters & Science, Meteorology, *500 Lincoln Dr., Madison, Wisconsin* 53706 (ATM77-20231)

The objective of this research is the development and improvement of short range (0-12 hr) prediction of precipitation. The primary emphasis will be on possible uses of satellite derived wind and radar echo data as initialization parameters. A selection of mesoscale wind data derived from synchronous meteorological satellite (SMS) data will be analyzed with regard to quality and value. Objective analysis techniques will be studied and comparisons with data from synoptic scale and mesoscale models will be made. In addition, the use of radar data to initialize prediction models for vertical motion will be considered and tested. A second goal will be the formulation of simple Lagrangian advection models designed to predict movement and changes in area of precipitation. These models assume the availability of data from comprehensive regional mesoscale models. Statistical and dynamical relationships between radar 'echo system' characteristics and model variables such as velocity, temperature and moisture, found by other investigators, would be used.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, G-SEAT OPTIMIZATION
D.C. MCGUIRE, U.S. Air Force, Human Resources Laboratory, *Williams A.F.B., Chandler, Arizona* 85224 (DF223950)

To investigate optimization of g-seat configurations, use of improved components, and software optimization.

A bench test set-up will be used to investigate hardware configurations, components, and adjustments. The configuration will include compressor, conoflow valve, booster valve, a g-seat bellow with instrumentation (potentiometer and accelerometer) and strip chart recorder. Software analysis will consist of organization and optimization by reducing unnecessary arrays, maximizing linear flow and eliminating unnecessary branching. The results will be applied to the g-seat systems of ASPT to improve their performance such as in lowered time constants, rise times, transport lags, and software execution time. Improved performance will make feasible emulation and evaluation on ASPT of new system design such as the a-10 simulator seat under development by Reflectone.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0002, VISUAL DISPLAY INTEGRATION FOR ADVANCED FIGHTER AIRCRAFT
E. STREETER, Hughes Aircraft Company, *Centinela Ave. & Teale St., Culver City, California* 90230 (DF322910; F33615-77-C-0521)

This is one of three parallel contracts aimed at developing better methods and criteria for interfacing tactical aircrews within advanced technology fighter aircraft (i.e., target first operational capability post-1985). Visual display design alternatives will be derived based upon mission requirements analyses, crew size/function options, and potential (aircraft, avionic, and display system) technology combinations. Engineering trade-off comparisons among the postulated alternatives will determine the incremental impact of specific applications of advanced display technology upon aircrew needs, capabilities and cockpit configurations. Figures of merit used in the trade-off analysis will include performance, safety, survivability and cost. Promising alternative designs will be selected for detailed development and evaluation under a follow-on contract.

This is the first of two forecasted contract efforts aimed at developing better methods and criteria for interfacing tactical aircrews within advanced technology fighter aircraft (i.e., target first operational capability post-1984). Visual display design alternatives will be derived based upon mission requirements analyses, crew size/function options, and potential (aircraft, avionic, and display system) technology combinations. Engineering trade-off comparisons among the postulated alternatives will determine the incremental impact of specific applications of advanced display technology upon aircrew needs, capabilities and cockpit configurations. Figures of merit used in the trade-off analysis will include performance, safety, survivability and cost. Promising alternative designs will be selected for detailed development and evaluation under a follow-on contract.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Labs.

6.0003, STUDY, COMPUTER-BASED LANDING SIGNAL OFFICER CARRIER AIRCRAFT RECOVERY MODEL
G. BORDEN, Human Performance Res. Inc., *616 Carlo Dr., Goleta, California* 93017 (DN894013; N61339-77-C-0110)

In support of development of a trainer for landing signal officers (LSO), a study is required to expand a laboratory-developed preliminary model of ideal lso 'waving' behavior to include precautionary and advisory calls. The model will be used to judge performance of student LSOs during training.

Initial model bases power and waveoff calls (EMCON model) on three approach parameters. Expanding number of monitored parameters and degree of approach segmentation will allow all NATOPS calls to be generated.

SUPPORTED BY U.S. Dept. of Defense, Navy, Human Factors Lab.

6.0004, ISD MANAGEMENT AND TECHNICAL REQUIREMENTS
J.P. HYMES, Courseware Incorporated, *7851 Mission Center Ct., San Diego, California* 92108 (DN694022; N61339-76-C-0062)

The diversity of operational contingencies in the simultaneous development of new training programs and new aircraft is such that no single technological approach is sufficient by itself. The objective of this project is to provide techniques and procedures to optimize the individually proven advantages of existing management, technical, instructional and support techniques into a comprehensive management system designed to meet the isd developmental requirements of any training program during aircraft weapon system RDT and E.

The program effort will be directed toward investigation of existing management of aircraft weapon system acquisition, instructional systems development processes, and training system support requirements to develop modified Navy management procedures and technical requirements to implement training system development in new aircraft weapon systems through the ISD process. These procedures and technical requirements will be applicable to aircrew members and maintenance personnel training systems.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Training Equipment Center

6.0005, SUPPLEMENTAL PANELS FOR THE PERFORMANCE CARREL
M.R. ROCKWAY, U.S. Air Force, Human Resources Laboratory, *Lowry Air Force Base, Denver, Colorado* 80230 (DF223750)

Present state-of-the-art electronics has promise for the design and construction of interactive training devices that could be utilized as self-sufficient instructional devices. These would resemble part-task and procedure trainers with interactive and response evaluation capabilities. Previous investigations have demonstrated the usefulness of the performance carrel as an instructional device but have also noted its cost, maintainability, and updating requirements. Many of these could be improved by expanding its capacity by utilizing supplementary face-panels and programming. The purpose of this work unit is to explore some of the additional possibilities especially those requiring less sophisticated computer control.

The approach will be to explore in-house some of the more promising capabilities that were not available at the time of the initial effort. the development of low-cost electronic components within the past four years has markedly altered the range of design capabilities. Milestones will include the following: (1) redesign of control system, Oct 77 through Feb 78, (2) implementation of control system, Feb 78 through 78, (3) evaluation of initial prototype, Jul 78 through Oct 78, (4) draft of technical evaluation, Mar 79 through Jul 79, (5) final product (TR) Sep 79

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0006, PREDICTION OF AIRSICKNESS SUSCEPTIBILITY IN NAVY FLIGHT STUDENTS
F.E. GUEDRY, U.S. Navy, Perceptual & Behav. Sci. Div., *Pensacola, Florida* 32508 (DN777378)

The objective is to develop procedures that will improve prediction of airsickness susceptibility. Potential benefits of this project are improvement of selection and placement methods and early detection of individuals who would benefit from therapeutic and preventive options.

Tests involving measurement of several immediate perceptual reactions and adaptive changes in reactions will be developed. Criteria of procedure selection will include feasibility for rapid administration as well as theoretical and empirical indications of validity. Concomitant measures in physiological indices will be taken on some tests. Intercorrelations among tests, including a motion sickness questionnaire, structured for use with entering flight students, will be determined to investigate the hypothesis that there are idiosyncratic tendencies in immediate and adaptive perceptual reactions that are related to motion sickness susceptibility. Tests administered to airsickness referrals and suitable controls will provide retrospective validity estimates. Time permitting, prospective validity estimates from coordination

with a new project on incidence and costs of airsickness will be obtained.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Aerospace Medical Research Lab.

6.0007, NO PATHOLOGY THRESHOLD
K.M. AYERS, U.S. Air Force, Aerospace Medical Res. Lab., *Wright Patt. A.F.B., Dayton, Ohio* 45433 (DF320470)

To develop nationally recognized data on chronic inhalation exposure effects of volatile Air Force chemicals and to provide safe occupational exposure limits (threshold limit values) which constitute concurrence with the Occupational Safety and Health Act as directed by executive order. The no pathology threshold portion of job order number 63020620 has been transferred to this new work unit.

To establish an acceptable, non-injury concentration of Air Force chemicals under subacute and chronic exposures for the primary target organs. The methods used will be gross, light microscopy, and electron microscopy of animal tissues exposed to the test chemicals. Hematological, clinical chemistry, microbiological, and immunological findings will be evaluated. Stringent quality control on animals used in subacute and chronic toxicology studies will be maintained. The data and recommendations for safe exposure level are provided the Air Force Surgeon General and the National Academy of Sciences Committee on Toxicology to obtain approved exposure criteria.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Labs.

6.0008, SAINT APPLICATION TO UPD-X
D.J. SEIFERT, U.S. Air Force, Aerospace Medical Res. Lab., *Wright Patt. A.F.B., Dayton, Ohio* 45433 (DF323610)

To provide a realistic application of the systems analysis integrated network of tasks (SAINT) to a major subsystem development, the all-weather, wide-area surveillance system - UPD-X. The SAINT technique has been under development in AMRL for some four to five years and has the potential for replacing the systems analysis, task analysis and operator interface definition portion of MIL-H-46855. The UPD-X development program has performed cost-trade off analysis of four approaches to system implementation to fulfill the UPD-X requirement. The human engineering thrust involves evaluation of operator performance under various UPD-X system alternatives using the SAINT model. A working model of the major man-machine interfaces in the system of upd-x will be used to provide a simulation capability for comparing approaches to system design.

The AMRL-developed SAINT technique for simulation modeling will be applied to the established system parameters of the UPD-X system design approaches to predict, at an acceptable confidence level, the system performance of the proposed designs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Labs.

6.0009, DEVELOPMENT OF HUMAN FACTORS ENGINEERING DATA AND METHODS FOR ADVANCED AIRBORNE SYSTEMS EXPLORATORY (BLOCK PROGRAM)
C.G. HALCOMB, Texas Tech University, School of Arts & Sciences, Psychology, *P.O. Box 4340, Lubbock, Texas* 79409 (DN881369; N62269-77-M-4271)

(1) To examine a set of data obtained from a study conducted at Texas Tech University concerned with target detection and complex visual displays, and to subject the data set to various analytical approaches; (2) to compare the relative strengths and weaknesses of each technique; and (3) select the most promising technique and show the utility of the selected approach for aiding the design engineer in the selection and consideration of display design parameters.

A. Survey visual target detection information analysis literature. b. Develop criteria for selection of documents to be analyzed. C. Develop classification scheme to categorize the methods selected for analysis. D. Analyze, compare and contrast selected analytical methods. e. Prepare final report.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, MOTION DRIVE SIGNALS FOR FLIGHT SIMULATORS - SOFTWARE SERVICES
R.M. JOHNSON, Appli Mation Incorporated, *1000 Woodcock Rd., Orlando, Florida* 32803 (DN794043; N61339-77-C-0155)

Provide software services for Project 7744, Motion Drive Signals for Flight Simulators. Support includes programming, documenting of various cockpit motion modules, engineering test modules, graphic plotting program and conversion of META symbol basic in-flight maneuver program to FORTRAN.

Modularize program requirements for uniform input/output and machine independence if possible. Code and evaluate various cockpit motion algorithms using standard engineering inputs.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Training Equipment Center

7.0002, COMPUTATIONAL MODELS FOR PICTURE DESCRIPTION
A. ROSENFELD, Univ. of Maryland, School of Engineering, Computer Sci, *College Park, Maryland* 20740 (MCS76-23763 A01)

This work continues the research begun under grant MCS-7623763, and focuses on three topics in image processing: picture segmentation techniques (e.g. by statistical cluster analysis); cooperating, or relaxation processes in picture analysis; picture processing applications (e.g. feature detection in satellite imagery, analysis of microscope images, automated reading of handwritten words).

SUPPORTED BY U.S. National Science Foundation, Div. of Mathematical & Computer Sciences

7.0003, PARALLEL COMPUTATION FOR DEVELOPING NONLINEAR CONTROL PROCEDURES
H. KAUFMAN, Rensselaer Polytechnic Inst., School of Engineering, Systems Engineering, *110 8TH St., Troy, New York* 12181 (DF140850; AF-AFOSR-3418-77)

This work unit supports the enhancement of advanced aerospace vehicles. This work unit is developing techniques to allow the use of parallel processing elements for flight control laws. The objective of this work unit is to determine a parallel microprocessor computer system which will allow the on-line processing of non-linear equations. On-line non-linear computation would permit USAF aircraft to hand-tailor flight control laws which would improve their performance.

Using a van der Pol system the control vector will be found using the variation of extremals method. The above algorithms will be modified so as to update the initial costate matrix by a parallel optimization procedure, and then by the parallel shooting algorithm. Using a representative high order flight control system design and evaluate optimal controllers. Evaluate improvement in performance using nonlinear rather than linear equations of motion. Consider an adaptive system which is adjusted on-line.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

7.0004, NUMERICAL METHODS FOR COMPRESSIBLE FLOW FIELD COMPUTATIONS
K.G. GUDERLEY, Univ. of Dayton, Graduate School, *300 College Park Ave., Dayton, Ohio* 45409 (DF141250; AF-AFOSR-3524-78)

This work will study specific questions regarding the mathematical background of numerical methods for compressible flow field computations. Problems of compressible flow require the

solution of partial differential equations. This can be done by direct computational approach, or, usually under certain limiting assumptions, by analytic means. The asymptotic considerstions to be done in this work represent an analytic approach under the assumption that the flow changes only slightly from station to station. Successful numerical work requires the understanding of the basic properties of the solution of the partial differential equation. A portion of this effort will be directed towards exploring this facet. Specific goals will be to create expertise in computing methods for high-speed aerodynamics and to improve existing methods for transonic flow computations. The immediate pay-off will be improvement of methods of computing flow fields which lead to either a reduction in computing time, an increase of accuracy, or to the possibility of attacking problems of a bigger scope. The perceived long-range pay-off will be improvement in the design of airfoils and reduction of flutter problems.

A study of the detailed mathematical properties of numerical algorithms for the computation of transonic flow fields will be made. The feasibility of using the method of characteristics for the computation of the supersonic part of the flow field will be examined. A comparison will be made of different iteration schemes, including finite-element schemes, from the point of view of computational economy. If time permits, an attempt will be made to develop a method for the computation of linearized supersonic flows based on integral equation techniques.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

7.0005, NONLINEAR ESTIMATION THEORY

B.D. TAPLEY, Univ. of Texas, School of Engineering, Aerospace Engin & Engin Mech, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: By the application of the Martingale Theory and smoothing properties to the study of nonlinear stochastic dynamic systems, an approximate nonlinear estimation algorithm has been developed. In order to determine its effectiveness, the nonlinear estimation algorithm as well as the extended Kalman filter are applied to the problem of estimating the trajectory of a planetary spacecraft using range, range-rate, sun-planet and star-planet angle measurements. The problems studied include the Jupiter fly-by segment of the Grand Tour mission, a ballistic reentry and the orbit determination requirements for a near-earth satellite. The result of the computer-simulated study shows that the nonlinear algorithm is far superior to the extended Kalman filter where the measurements are highly nonlinear. A comparison of the algorithm with other nonlinear estimation algorithms is being made also.

SUPPORTED BY University of Texas

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, SPECTROSCOPY AND QUANTUM ELECTRONICS

A.L. SCHAWLOW, Stanford University, School of Hum. & Sciences, Physics, *Palo Alto, California* 94305 (PHY77-09687 A02)

The application of modern optical devices, such as advanced kinds of lasers, is proposed for basic studies in physics. In the course of these studies the laser techniques will be refined and extended, and new sensitive methods of laser spectroscopy will be explored and developed. The extremely high resolution permitted by the techniques of Doppler-free nonlinear spectroscopy (saturation, polarization, two-photon) will be used to study fine and hyperfine structures in spectra of atoms and simple molecules. Use of short laser pulses in new ways for high-resolution spectroscopy, and the extension of high-resolution methods to shorter ultraviolet wavelengths are planned. The spectrum of simple one-electron atoms will be studied in high resolution, to probe the limits of quantum electrodynamics, and to improve the values of fundamental constants. Saturation and polarization labeling techniques will be used and extended to simplify the analysis of complex atomic and molecular spectra. New techniques for measuring wavelengths and frequency intervals will be developed and studied. Laser methods for the ultrasensitive and highly selective detection of atoms and molecules will be explored. The development of a dye-laser-like tunable ultraviolet laser, pumped by a molecular hydrogen laser, which would be a valuable tool for laser studies of atoms and molecules is also planned.

This work is a continuation of that currently supported under NSF grant PHY74-14786A03.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0002, INTERACTION OF HIGH-POWERED LASERS WITH PLASMAS

K.A. BRUECKNER, Univ. of California, Graduate School, Physics, *P.O. Box 109, San Diego, California* 92037 (EY-76-S-03-0034 PA 268)

The research will be directed at the interaction of lasers with plasmas, with emphasis on the wavelength dependence on the processes of absorption and hydrodynamic energy transfer. Particular emphasis will be given to the effect of ponderomotive forces, the production of fast electrons and ions, and the coupling to the hydrodynamic implosion process. Additional studies are proposed of the effect on implosion hydrodynamics of composite shell structure.

The studies will be based on experimental data obtained by close liaison with laser programs in the U.S.A. and, as far as possible, on the programs in Europe and the U.S.S.R.

SUPPORTED BY U.S. Dept. of Energy, Div. of Laser Fusion

8.0003, FUNDAMENTAL ASPECTS OF THE THEORY OF ATOMIC COLLISIONS

W. LICHTEN, Yale University, School of Arts & Sciences, Physics, *206 Elm, New Haven, Connecticut* 06520 (PHY78-08432)

Theoretical research in Atomic Physics, currently supported under NSF grant PHY74-09408 A03 will be continued. The topics to be investigated include studies of basic atomic and molecular theory in: 1) atomic collisions, from the standpoint of the electron promotion model, 2) atomic and molecular processes in intense electromagnetic fields, 3) astrophysics of the interstellar medium.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0004, ELECTRON AND HOLE MOBILITIES AND RESISTIVITY IN SILICON

S.S. LI, State University of Fla. Sys., School of Engineering, Electrical Engin, *220 Black Hall, Gainesville, Florida* 32611 (ENG76-81828)

This research program is directed toward meeting the following objectives: 1. To develop adequate theoretical expressions for computing hole mobility and restivity as a function of dopant density in boron and gallium doped p-type silicon for dopant densities from 10 to the 13th power to 10 to the 20th power per cc and for temperatures between 77 and 400 degrees K, and to compare the theoretical calculations with experimental data. 2. To conduct measurements of resistivity and mobility of boron-doped silicon with dopant densities from 10 to the 14th power to 10 to the 20th power per cc and for temperatures between 77 and 400 degrees K. 3. To extend theoretical and experimental studies of the mobility-dopant density relation in n-type silicon for dopant densities from 3 times 10 to the 18th power to 10 to the 20th power per cc. 4. To determine the electron mobility as a function of dopant density in n-type silicon for temperatures from 77 to 500 degrees K, and to compare the results with theoretical calculations.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

8.0005, APPLICATIONS OF QUANTUM ELECTRODYNAMICS TO PROCESSES OF CURRENT INTEREST IN ATOMIC AND NUCLEAR PHYSICS

W.R. JOHNSON, Univ. of Notre Dame, School of Science, Physics, *Notre Dame, Indiana* 46556 (PHY77-15141)

This project is a two-year continuation of research on problems of current interest involving quantum electrodynamics initiated under grant PHY74-00809 A02.

Professor Johnson plans to extend his work on the RRPA to study relativistic and correlation effects in the low-frequency photoelectron spectroscopy. He plans to study the noble gases Ne, Ar, Kr, and Xe, and the period II elements Be, Mg, Hg. He expects to include RRPA calculations of autoionizing resonances in his studies. Further work on self-energy level shifts is also planned. Present numerical methods will be extended to study self-energy corrections to L and M shell binding in heavy atoms, and to examine self-energy corrections in heavy muonic atoms.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0006, APPLICATIONS OF ENGINEERING METHODS IN PLASMA SCIENCE

H. LASHINSKY, Univ. of Maryland, Inst. for Fluid Dyn. & Math., *College Park, Maryland* 20742 (ENG77-02128)

The objective of this program is to examine the supression of low-frequency instabilities in a plasma in a magnetic field by the application of high-frequency electric fields. Specific problems to be treated include: 1. Stabilization of the collisionless drift instability by the high-frequency transverse (to the magnetic field) electric fields associated with the lower-hybrid resonance. 2. Stabilization of the collisonless drift instability by the application of high-frequency parallel electric fields. 3. Development of non-contact methods for the introduction of a high-frequency electric field with known spatial distribution and amplitude into a plasma. 4. Coupling to the lower hybrid resonance in a bounded plasma of dimension comparable to the wavelength. Experimental aspects of the research will be performed on a Q machine.

This is a continuation of research previously supported under NSF grant ENG-7604635.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

8.0007, PHOTOPRODUCTION OF PIONS FROM COMPLEX NUCLEI

E.C. BOOTH, Boston University, School of Liberal Arts, Physics, *755 Commonwealth Ave., Boston, Massachusetts* 02215 (PHY77-14903)

A program of meson photoproduction studies will be continued at the MIT Bates Electron Linear Accelerator, in collaboration with scientists from MIT and other institutions. (a) Coherent, threshold-region neutral pion production total cross sections will be measured to investigate the reaction mechanism and the interaction between the produced pion and the residual nucleus. (b) The photoproduction of charged and neutral pions and of protons will be studied with moderate energy resolution in the region of the 3-3 resonance. (c) The above studies will be extended, subject to detailed design and feasibility studies, to high-resolution studies of neutral photo pion angular distributions and to a study of the energy dependence of multiparticle production. This work is a continuation of that performed under Foundation grant PHY76-15850.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0008, PROPERTIES OF AMORPHOUS SEMICONDUCTORS

W. PAUL, Harvard University, School of Arts & Sciences, Engineering & Applied Physics, *16 Divinity Ave., Cambridge, Massachusetts* 02138 (DMR78-10014)

This a continuation of research previously supported by NSF grant DMR-7615325.

Samples of amorphous group 4 and group 3005 semiconductors with incorporated hydrogen and other dopants will be prepared and characterized chemically and structurally. Appropriate property measurements, among them photoluminescence, electron spin resonance, optical and transport, will be carried out and correlated in order to gain a comprehensive, self-consistent model of the behavior of the substance. Special attention will be paid to the possibility that strong electron-phonon interactions affect the optical properties through developing Stokes shifts and the transport properties through the creation of small polarons. Measurements made as a function of the hydrogen content of the films will be done in order to try to separate out the intrinsic properties of the disordered element or compound from those of the alloy with hydrogen. In the case of the binary compounds, special attention will be paid to the effects of like-atom bonds in determining the properties.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0009, INVESTIGATION OF ATOMIC AND MOLECULAR PROCESSES WITH MODERN PRECISION SPECTROSCOPIC TECHNIQUES

A. JAVAN, Mass. Inst. of Technology, School of Science, Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (PHY77-18761 A02)

The proposed research consists of the investigation of atomic and molecular processes in the areas of Doppler free laser spectroscopy, application of accurate interferometric laser wavelength measurements and absolute frequency determinations to highly precise spectroscopic observations, single and multi-photon laser initiated chemistry and determination of dynamics of gas kinetic molecular processes. The latter topic of studies will emphasize measurements of molecular relaxation parameters and energy storage useful in laser technology. The major objective of the program will be the studies of fundamental atomic and molecular processes.

This work is a continuation of that currently supported under NSF grant number PHY75-17584 A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0010, BLACK-HOLE PHYSICS AND RELATIVISTIC ASTROPHYSICS

S.A. TEUKOLSKY, Cornell University, School of Arts & Sciences, Physics, *Ithaca, New York* 14853 (PHY78-09795)

Theoretical research in relativistic astrophysics and gravitation initiated under NSF grant PHY7607297A01 will be continued. The following topics will be investigated: 1) relativistic spherical collapse; 2) effect of gravitational waves from gravitational collapse on surrounding matter; 3) numerical calculation of gravitational wave fluxes; 4) dynamics of the Virgo supercluster; 5) tidal disruption of clusters of galaxies; 6) density profiles around cluster of galaxies; 7) hydrodynamical problems in astrophysics.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0011, ATOMIC INTERACTIONS WITH ELECTRONS AND FIELDS IN GROUND AND EXCITED STATES

B. BEDERSON, New York University, School of Arts & Sciences, Physics, *421 1ST Ave., New York, New York* 10012 (PHY77-28127)

A two-year research program will use atomic beam techniques for the study of interactions between atoms, electrons, radiation and applied electric fields. The principal aims are to perform increasingly rigorous tests of collision theory as applied to simple atomic and molecular systems, and to explore new methods for extracting information from collision experiments.

The atomic beam recoil technique will be used to perform electron scattering measurements of total cross sections for the 32P 3/2 state of sodium, 'superelastic' differential and total cross sections, 32P 3/2 -yields 32S 1/2, 'superelastic' differential cross sections with spin preparation and analysis after scattering for specific magnetic substates of the above reaction, and elastic scattering for 32P 3/2 m with and without spin analysis.

An additional goal of the proposed research concerns the measurements of atomic and molecular polarizabilities.

This is a continuation of work supported by NSF Grant PHY74-03999 A03.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0012, ATOMIC COLLISIONS AND PLASMA PHYSICS 15740-P

M.A. BIONDI, Univ. of Pittsburgh, School of Arts & Sciences, Physics, *4200 5TH Ave., Pittsburgh, Pennsylvania* 15260 (DA0F9142; DAAG29-78-G-0044)

To study atomic collisions related to the upper atmosphere. Relevance - this research provides basic information for ballistic missile defense systems, and has the potential for contributing parameters for studies of laser propagation in the atmosphere.

Experimental investigations of ion-molecule reactions and electron-ion recombination under conditions, and for species, of interest to DNA.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

8.0013, ATOMIC AND MOLECULAR PHYSICS

L.G. CHRISTOPHOROU, U.S. Dept. of Energy, Health Physics Division, *P.O. Box E, Oak Ridge, Tennessee* 37830 (000722)

Quantitative and integrated experimental and theoretical studies on low-energy electron-molecule interaction processes, negative ions, electron transport and photoionization of molecules in low- and high-pressure gases and in liquids. Obtain coherent picture of radiation interaction with matter especially low-energy electrons. Link knowledge on basic radiation interaction processes in gases with that on similar processes in condensed media for systems of radiobiological as well as of environmental and toxicological interest. Link physics with chemistry and both with life sciences and establish in this way a sound understanding of radiation effects and mechanisms on the molecular level. Continue vigorously basic research and publish regularly and promptly the results.

SUPPORTED BY U.S. Dept. of Energy, Div. of Biomedical & Environmental Research

8.0014, SPIN ORIENTATION DEPENDENCE IN ELECTRON COLLISIONS WITH ATOMS, MOLECULES AND SURFACES

G.K. WALTERS, Rice University, Graduate School, Physics, *6100 Main St., Houston, Texas* 77001 (C-704)

SUPPORTED BY Robert A. Welch Foundation

8.0015, EQUILIBRIUM, STABILITY AND TURBULENCE IN MAGNETOHYDRODYNAMICS AND IN GUIDING CENTER PLASMA THEORY

G. VAHALA, Coll. of William & Mary, School of Arts & Sciences, Physics, *Ewell Hall, Williamsburg, Virginia* 23185 (E(40-1)-5260)

Finite wavelength guiding center plasma stability of the bumpy theta-pinch is examined by a Normal Mode analysis. It is shown that previous bumpy theta-pinch calculations are recoverable as special cases of this analysis. The ideal magnetohydrodynamic and guiding center plasma growth rates are compared for various pressure anisotropies and for various wavenumbers of the field line bumpiness. The conditions on the guiding center plasma equations are shown to give upper and lower bounds on the permissible pressure anisotropy which corresponds to the Alfven continuum staying on the stable side of the spectrum and to the particle mirror force not having a singularity. It is also found that the higher azimuthal m greater than or equal to 2 modes have growth rates larger than m 0 1 mode. The above axisymmetric calculation has been extended to helical symmetry and this is still being pursued along with calculating analytic flux conserving Tokamak equilibria, and the predictions of turbulence theory (actually equilibrium statistical mechanics) on possible quiescent plasma states.

BIBLIOGRAPHIC REFERENCES: T.E. Cayton and G. Vahala, Stability and Spectra of the Bumpy Theta Pinch, Phys. Fluids, 19, 590 (1976); H.J. Schmidt and G. Vahala, Guiding Center Plasma Stability of the Bumpy Theta Pinch With Weak Pressure Anisotropies, Plasma Physics, 18, 499 (1976)

SUPPORTED BY U.S. Dept. of Energy

8.0016, PARITY TESTS IN ATOMS

E.N. FORTSON, Univ. of Washington, Graduate School, Physics, *C301 Health Sciences Bldg., Seattle, Washington* 98105 (PHY78-05897)

This is an experimental program in atomic physics. Experiments designed to look for a breakdown of parity conservation in free atoms can provide information about the neutral weak current interaction between electrons and nucleons. The present research is searching for optical rotation in atomic bismuth. Failure thus far to observe any such parity non-conservation in bismuth at the level predicted on the basis of Weinberg-Salem Theory of Neutral Currents indicates that the theory likely needs to be modified. To establish this important result more firmly and to test predictions of other weak interaction models, further optical rotation experiments with bismuth and with other elements will be carried out. These experiments should provide information that will complement neutrino studies of neutral current interactions at high energy.

This is a continuation of work currently supported under NSF Grant PHY74-17319 A05.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, WIDE FIELD MICHELSON MEASUREMENT DEMONSTRATION

A.M. TITLE, Lockheed Missiles & Space Co., *3251 Hanover St., Palo Alto, California* 94304 (AST77-21084)

Wide field of view optical systems with very high spectral resolution are needed for extended astronomical sources such as the Sun. Laboratory tests have shown that a wide field Michelson filter is practical. A two stage wide field Michelson filter will be developed and fabricated. After tests on the filter in the laboratory and on the Lockheed Solar Observatory telescope, observations of the Sun will be carried out at Kitt Peak National Observatory. This data will provide information on spectral line profiles and solar magnetic field strengths on the Sun.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0002, MORPHOLOGICAL INVESTIGATIONS OF STELLAR SPECTRA AND CLUSTERS OF GALAXIES

W.W. MORGAN, Univ. of Chicago, School of Physical Sciences, Astronomy & Astrophysics, *5801 S. Ellis Ave., Chicago, Illinois* 60637 (AST76-21710 A01)

This project will provide funds for completion of the Revised MK Atlas for Stars Earlier than the Sun by Morgan, Abt and Tapscott. This includes continued development of the spectral classification system. A few photographic sets of the new Atlas will be prepared; a printed edition will follow when the master negatives are completed.

A program aimed at classification of approximately 1000 stars on this revised system will be initiated. The Atlas consists almost exclusively of individual stars whose spectra define certain reference points in the two-dimensional spectral type luminosity-class diagram. Before effective use can be made of the Atlas, it will be necessary to produce a body of spectral types, determined by means of these standard stars, in such a manner that each frequently-used classification cell will contain at least ten stars.

Preparation of a General Catalog of cD Galaxies will begin. This will be a catalogue of clusters of galaxies containing supergiant cD galaxies, huge elliptically shaped galaxies frequently found in or near the centers of clusters of galaxies.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0003, THE PHYSICAL PROPERTIES AND EVOLUTION OF GALACTIC NEBULAR COMPLEXES
H.R. DICKEL, Univ. of Illinois, School of Liberal Arts & Sci., Astronomy, *Urbana, Illinois* 61801 (AST77-21021)

The study of molecules in galactic nebular complexes has led to physical models of the structure and dynamics of these molecular clouds. There is observational evidence for fragmentation, systematic motions, and an evolutionary progression within these clouds. The regions to be studied will include ionized hydrogen (HII) region-molecular cloud complexes. The dynamics of these clouds will be explored in the context of possible processes of star formation, the evolutionary development of prostellar envelopes and the transfer of the radiation in the molecular lines. Models which can (or cannot) explain an all-pervasive broad-wing feature in the line profiles we have observed in the DR21-W75 area will be investigated. The self-absorption interpretation of our obseved 12CO profiles toward W3 will be further examined by comparing our observations of other molecules, such as 13CO, C18O, HCN, CS, and H2CO (at 6 cm. and 2 mm.), with their behavior predicted from the model-calculations. The possibility of self-absorption of the 12CO emission toward NGC 7538 will be studied. The investigation of the apparent correlation of molecular line width delta V with temperature TB found for a limited number of sources will be continued.

This is a continuation of research done under grant AST 75-2208 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0004, INVESTIGATIONS OF GALACTIC STRUCTURE
F.J. KERR, Univ. of Maryland, School of Arts & Sciences, Astronomy, *College Park, Maryland* 20742 (AST77-26898)

The main project will involve studies of the extensive data from new radio astronomical 21-cm surveys of the Southern Milky Way. These data will act as a resource for a wide range of investigations. In addition, high-sensitivity searches for gas in elliptical galaxies will be carried out, distant spirals will be studied, and an investigation of the gas-to-dust ration in the galactic disk will be continued.

This is a continuation of research done under grant AST 75-09734 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0005, RADIO ASTRONOMY AT THE HAYSTACK OBSERVATORY
P.B. SEBRING, Northeast Radio Observ. Corp., *Westford, Massachusetts* 01886 (AST75-14701 A02)

The Haystack Observatory will provide a radio astronomy observing facility available to all U.S. astronomers and easily accessible to radio astronomy groups based in New England. A great deal of research in the coming year will center around programs aimed at understanding the characteristics of molecules found in interstellar space and their relationship to clouds of dust and hydrogen gas out of which stars are being formed. Molecules to be considered include water, methanol and ammonia.

A considerable amount of effort will be devoted to Very Long Baseline Interferometry. This work involves worldwide cooperative projects and now provides the highest resolution and most accurate positional measurements in astronomy. One-fourth of the radio observing time will be used for this type of work.

This is a continuation of support under NSF Grant AST 75-14701.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0006, THEORETICAL SOLAR SYSTEM STUDIES
T. GOLD, Cornell University, School of Physical Sciences, Applied Physics, *Ithaca, New York* 14850 (AST74-17838 A03)

Support is for the continuation of theoretical research on significant problems of solar system physics. Study will be directed toward dynamical problems of the evolution of the orbits and spins of solar system bodies, as well as the origin of comets and planetary satellites. Other subjects of research will include tidal dissipation in the major planets and the effects of tidal friction on the rotation of the earth, also, the evolution of the surface of Mars. Study will be continued on the formation of the sun from a disk, as a body that condensed cold, and ignited when sufficient mass had accumulated to initiate hydrogen burning in the deep interior. Other topics will be undertaken as opportunities arise.

Prior support was by NSF grant AST 76-08177.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0007, INTERNATIONAL TRAVEL TO ANGLO-AUSTRALIAN TELESCOPE AND CTIO
P.A. WEHINGER, Ohio State University, School of Math. & Phys. Scis., Astronomy, *164 W. 17th Ave., 102 Administration Bldg., Columbus, Ohio* 43210 (AST78-07567)

Dr. Wehinger will travel to Australia to work with Dr. Boksenberg from the University College London during four nights of observing allocated at the Anglo-Australian Telescope (AAT) near Coonabarabran, Australia. Spectroscopic observations will be done on selected low redshift quasars that have been selected based on their red shifts (z approximately 0.07-0.30) and on deep direct imaging data obtained with the 2.2 meter telescope at Mauna Kea Observatory. The AAT and the Image Photon Counting System (IPCS) represent a powerful combination uniquely suited to the proposed observing program.

The primary aim of the observations is to test the widely held but still unproved hypotheses that 1) Quasars are the luminous nuclei of distant galaxies, and 2) Their red shifts are cosmological. IPCS spectra will be obtained of 1) The underlying optical structure recently discovered near a sample of low red shift quasars, and 2) Faint objects which may be cluster galaxies, possibly associated with the quasars.

Dr. Wehinger has also been allocated time at CTIO and will stop there on his return trip.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0008, RADIO ASTRONOMICAL OBSERVATIONS OF TWENTY-ONE CENTIMETER ABSORPTION LINES IN QUASI-STELLAR OBJECTS
A.M. WOLFE, Univ. of Pittsburgh, School of Arts & Sciences, Physics & Astronomy, *4200 5TH Ave., Pittsburgh, Pennsylvania* 15260 (AST76-15202 A01)

Theoretical and observational investigatins of redshifted 21 cm. absorption lines that form in gas located in front of quasi-stellar objects (QSOs) will be carried out. The 21 cm. absorption lines are sensitive to local excitation conditions, and can be studied with high angular and spectral resolution. This investigation should help to answer the general question of where absorption-line gas in QSOs is located; near the QSO, or in an intervening galaxy?

It is generally thought that neutral gas intrinsic to a QSO is transparent to 21 cm. radiation because of the high spin temperature resulting from the bright 21 cm. continuum. The cm - opacity can be appreciable, however, if Lyman alpha (L alpha) photons in sufficient numbers penetrate a layer of neutral hydrogen which has an extremely large L alpha optical depth. A qualitative description of the radiative transfer of L alpha through the layer is given, and a numerical code designed to solve this problem is also described. The code has been tested successfully and answers to the full problem are expected shortly. A calculation investigating the propagation of ionization fronts driven by Lyman continuum radiation emitted by QSOs will be done.

New experiments, using techniques of Very Long Baseline Interferometry, will be done to further elucidate the structure of the absorbing gas. Single-dish radio astronomy experiments to discover 21 cm absorption in low-ionization level clouds will be completed. This is a continuation of work done under grant AST 76-15202.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0009, SPECTROSCOPIC OBSERVATIONS OF QUASI-STELLAR OBJECTS

B.J. WILLS, Univ. of Texas, Graduate School, *200 W. 21st, Austin, Texas* 78712 (AST76-81338 A01)

The University of Texas Radio Astronomy Observatory is currently engaged in a deep radio source survey (approximately 5000 sources per steradian), providing arc-second positional accuracy for the sources, which can then be optically identified with quasi-stellar objects (QSOs) and galaxies using even more accurate optical positions. Spectroscopic and other optical work on the identified radio sources will be continued. Telescopes at University of Texas' McDonald Observatory, where linear detectors (Self-Scanned Digicon, Image-Dissector Scanner) will soon be in routine operation, will be used.

The program include the study of large samples of bright and faint QSOs which may be used to investigate the space density and luminosity evolution of QSOs, for quantitative statistical studies of line strengths and their dependence on redshift and other QSOs, for quantitative statistical studies of line strengths and their dependence on red shift and other QSO properties, and for studies of interesting individual objects, such as the BL Lac-type ('lineless') objects, the extremely compact N galaxies and Seyfert-type nuclei, and QSOs with complex absorption-line spectra.

This is a continuation of research done under grant AST 76-81338.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0010, THEORETICAL RESEARCH ON PLANETARY ATMOSPHERES

J.W. CHAMBERLAIN, Rice University, Graduate School, Space Physics & Astronomy, *6100 Main St., Houston, Texas* 77001 (ATM74-02186 A03)

This grant funds the first year of a three-year continuing grant for a study of planetary atmospheres, with emphasis on the Earth's atmosphere. The research areas to be investigated are: 1. The physics and chemistry of the earth's stratosphere, with emphasis on alterations in the chemical and thermal balance of ozone and implications for climate change. 2. Planetary exospheres and atmospheric escape, with emphasis on the effects of charge-exchange collisions, as derived from solutions of the full Boltzmann equation. Attention will be focused on predictions of high-resolution profiles of Lyman-Alpha radiation, which should contain a large amount of information on the structure of a planet's exosphere. 3. Spectroscopic analysis of the atmospheres of the planets, with emphasis on radiative-transfer theory as applied to realistic models of atmospheric structure and chemistry. 4. Aeronomy of the ionosphere, including radiation polarization, the airglow, and aurora.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N79-12997* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING. A CONTINUING BIBLIOGRAPHY WITH INDEXES. SUPPLEMENT 101
Oct. 1978 101 p
(NASA-SP-7037(101)) Avail: NTIS HC E02 CSCL 01A

This bibliography lists 335 reports, articles, and other documents introduced into the NASA scientific and technical information system in September 1978. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N79-12998 Washington Univ., Seattle.
EFFECT OF STRUCTURAL PARAMETERS ON THE FLAP-LAG FORCED RESPONSE OF A ROTOR BLADE IN FORWARD FLIGHT Ph.D. Thesis
Daniel Patrick Schrage 1978 104 p
Avail: Univ. Microfilms Order No. 7823149

Research conducted to obtain a better understanding of the structural coupling parameters that contribute to rotor blade forced response and stability in forward flight is reported. A new analytical method, named eigenvalue and modal decoupling analysis, was developed to solve the flap-lag equations of motion with periodic coefficients. An extension of the Floquet Transition Matrix Method, the eigenvalue and modal decoupling analysis is used to obtain the forced response of the flap-lag equations. Application of this analysis to study four different rotor configurations has provided new insight into the stability and response problem. The results obtained from an analysis that provides rotor loads and stability simultaneously give the rotor design engineer valuable guidelines to study the tradeoffs necessary during the design phase of new rotor systems. Dissert. Abstr.

N79-12999 Cincinnati Univ., Ohio.
A NUMERICAL TECHNIQUE FOR THE TRIPLE-DECK PROBLEM Ph.D. Thesis
Michele Napolitano 1978 111 p
Avail: Univ. Microfilms Order No. 7821583

An alternating direction implicit technique was applied to the problem. A relaxation-like time derivative for the total displacement was added to the right hand side of the momentum equation and a two step time marching procedure was repeated until a converged steady state solution was achieved. In the first time step, or sweep, the bottom deck boundary-layer-like equations were solved by a standard marching technique. Second order accurate central difference representations and first order accurate windward ones were used for the partial derivatives with respect to the normal and longitudinal coordinates respectively. The finite difference equations were linearized in space and a special superposition technique was used to generate solutions. In the second sweep the two point boundary value problem, arising from the use of the interaction law for supersonic flow, was solved by use of the simple Thomas algorithm. Dissert. Abstr.

N79-13000*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF THICKNESS ON THE AERODYNAMIC CHARACTERISTICS OF AN INITIAL LOW-SPEED FAMILY OF AIRFOILS FOR GENERAL AVIATION APPLICATIONS
Robert J. McGhee and William D. Beasley Jun. 1976 51 p refs
(NASA-TM-X-72843) Avail: NTIS HC A04/MF A01 CSCL 01A

Wind tunnel tests were conducted to determine the effects of airfoil thickness-ratio on the low speed aerodynamic characteristics of an initial family of airfoils. The results were compared with theoretical predictions obtained from a subsonic viscous method. The tests were conducted over a Mach number range from 0.10 to 0.28. Chord Reynolds numbers varied from about 2.0 x 1 million to 9.0 x 1 million. G.G.

N79-13001*# Lockheed-Georgia Co., Marietta.
ANALYSIS OF A THEORETICALLY OPTIMIZED TRANSONIC AIRFOIL
M. E. Lores, K. P. Burdges, and G. D. Shrewsbury Nov. 1978 102 p refs
(Contract NAS2-8697)
(NASA-CR-3065; LG78ER0212) Avail: NTIS HC A06/MF A01 CSCL 01A

Numerical optimization was used in conjunction with an inviscid, full potential equation, transonic flow analysis computer code to design an upper surface contour for a conventional airfoil to improve its supercritical performance. The modified airfoil was tested in a compressible flow wind tunnel. The modified airfoil's performance was evaluated by comparison with test data for the baseline airfoil and for an airfoil developed by optimization of leading edge of the baseline airfoil. While the leading edge modification performed as expected, the upper surface re-design did not produce all of the expected performance improvements. Theoretical solutions computed using a full potential, transonic airfoil code corrected for viscosity were compared to experimental data for the baseline airfoil and the upper surface modification. These correlations showed that the theory predicted the aerodynamics of the baseline airfoil fairly well, but failed to accurately compute drag characteristics for the upper surface modification. S.B.S.

N79-13002*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF WING LEADING-EDGE FLAP DEFLECTIONS ON SUBSONIC LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A WING-FUSELAGE CONFIGURATION WITH

A 44 DEG SWEPT WING
William P. Henderson Nov. 1978 38 p refs
(NASA-TP-1351; L-12481) Avail: NTIS HC A03/MF A01 CSCL 01A

An investigation was conducted to determine the effects of wing leading-edge flap deflections on the subsonic longitudinal aerodynamic characteristics of a wing-fuselage configuration with a 44 deg swept wing. The tests were conducted at Mach numbers from 0.40 to 0.85, corresponding to Reynolds numbers (based on wing mean geometric chord) of 2.37 x 1,000,000 to 4.59 x 1,000,000 and at angles of attack from -3 deg to 22 deg. The configurations under study included a wing-fuselage configuration and a wing-fuselage-strake configuration. Each configuration had multisegmented, constant-chord leading-edge flaps which could be deflected independently or in various combinations. Author

N79-13003*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF SUPERSONIC STALL BENDING FLUTTER IN AXIAL-FLOW COMPRESSOR BY ACTUATOR DISK THEORY
John J. Adamczyk Nov. 1978 58 p refs
(NASA-TP-1345; E-9186) Avail: NTIS HC A04/MF A01 CSCL 01A

An analytical model was developed for predicting the onset of supersonic stall bending flutter in axial-flow compressors. The analysis is based on two-dimensional, compressible, unsteady actuator disk theory. It is applied to a rotor blade row by considering a cascade of airfoils. The effects of shock waves and flow separation are included in the model. Calculations show that the model predicts the onset, in an unshrouded rotor, of a bending flutter mode that exhibits many of the characteristics of supersonic stall bending flutter. The validity of the analysis for predicting this flutter mode is demonstrated. Author

N79-13004*# Northrop Corp., Hawthorne, Calif. Aircraft Div.
INVESTIGATION OF STEADY AND FLUCTUATING PRESSURES ASSOCIATED WITH THE TRANSONIC BUFFETING AND WING ROCK OF A ONE-SEVENTH SCALE MODEL OF THE F-5A AIRCRAFT Final Report
Chintsun Hwang and W. S. Pi Nov. 1978 213 p refs
(Contract NAS2-8734)
(NASA-CR-3061) Avail: NTIS HC A10/MF A01 CSCL 01A

A wind tunnel test of a 1/7 scale F-5A model is described. The pressure, force, and dynamic response measurements during buffet and wing rock are evaluated. Effects of Mach number, angle of attack, sideslip angle, and control surface settings were investigated. The mean and fluctuating static pressure data are presented and correlated with some corresponding flight test data of a F-5A aircraft. Details of the instrumentation and the specially designed support system which allowed the model to oscillate in roll to simulate wing rock are also described. A limit cycle mechanism causing wing rock was identified from this study, and this mechanism is presented. G.Y.

N79-13005*# Bell Helicopter Co., Fort Worth, Tex.
EXPERIMENTAL INVESTIGATION OF THE SUBWING TIP AND ITS VORTEX STRUCTURE Final Report
James L. Tangler Washington NASA Nov. 1978 50 p refs
(Contract NAS1-14465)
(NASA-CR-3058) Avail: NTIS HC A03/MF A01 CSCL 01A

A better understanding of the subwing's vortex structure relative to a square tip for several angles of attack and yaw angles is provided. This comparison included subwings of various chord size and airfoil thickness. Flow visualization, together with performance and wake measurements, provided a comparison between the square tip and subwing tips during both a semi-span wind-tunnel test and a small-scale rotor hover-stand test. G.Y.

N79-13006*# Old Dominion Univ. Research Foundation, Norfolk, Va.
ANALYTICAL STUDIES OF SEPARATED VORTEX FLOW ON HIGHLY SWEPT WINGS Final Report
John M. Kuhlman Washington NASA Nov. 1978 65 p
(Grant NsG-1357)
(NASA-CR-3022) Avail: NTIS HC A04/MF A01 CSCL 01A

A subsonic potential flow mathematical model of the flow past slender aerodynamic surfaces with sharp edges and separated vortex flow is reported. Comparisons with experimental data are presented for overall forces and pressure distributions for a series of thin, low aspect ratio wings, including both flat and conically cambered ones. A discussion is presented of the limitations of the current theory, and some suggestions are made as to how the theory might be improved. Details of program data input modifications for three-dimensional geometry are described in an appendix. G.G.

N79-13007*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
OPERATIONAL MANUAL FOR TWO-DIMENSIONAL TRANSONIC CODE TSFOIL Final Report
Stephen S. Stahara Dec. 1978 185 p refs
(Contract NAS2-8648)
(NASA-CR-3064; NEAR-TR-94) Avail: NTIS HC A09/MF A01 CSCL 01A

This code solves the two-dimensional, transonic, small-disturbance equations for flow past lifting airfoils in both free air and various wind-tunnel environments by using a variant of the finite-difference method. A description of the theoretical and numerical basis of the code is provided, together with complete operating instructions and sample cases for the general user. In addition, a programmer's manual is also presented to assist the user interested in modifying the code. Included in the programmer's manual are a dictionary of subroutine variables in common and a detailed description of each subroutine. G.G.

N79-13008*# National Aeronautics and Space Administration, Washington, D. C.
HIGH-SPEED AERODYNAMICS
G. F. Telenin, ed. Dec. 1978 122 p refs Transl. into ENGLISH from Moscow State Univ. Inst. of Mech. Sci. Trans. (Moscow), no., 5, 1970 p 1-108 Transl. by ESDUCK (Franklin), Cairo, Egypt
(Contract NSF C-724)
(NASA-TT-F-17160) Avail: NTIS HC A06/MF A01 CSCL 01A

The results of the numerical studies carried out on the supersonic flow of bodies in aerodynamic tubes are presented. Data on the following topics were examined: (1) spatial flow of bodies of different forms; (2) unsteady flow of segmental blunt bodies; (3) three dimensional boundary layer; (4) unsteady boundary layer; (5) underexpanding supersonic jets; and (6) the interaction of supersonic jets with an acoustic field. B.B.

N79-13009*# Applied Research Lab., State College, Pa.
MEASUREMENTS OF INLET FLOW DISTORTIONS IN AN AXIAL FLOW FAN (6 AND 9 BLADE ROTOR)
L. C. Barr 10 Oct. 1978 551 p refs
(Grant NsG-3031)
(NASA-CR-157842; TM-78-252) Avail: NTIS HC A24/MF A01 CSCL 01A

A large quantity of experimental data on inlet flow distortions in an axial flow fan were obtained. The purpose of the study was to determine the effects of design and operating variables and the type of distortion on the response of an axial flow turbomachinery rotor. Included are background information and overall trends observed in distortion attenuation and unsteady total pressure losses. G.G.

N79-13010# Georgia Inst. of Tech., Atlanta.
A THEORY FOR AERODYNAMIC FORCES AND MOMENTS Interim Technical Report
J. C. Wu Jun. 1978 58 p refs
(Contract N00014-75-C-0249)
(AD-A058695) Avail: NTIS HC A04/MF A01 CSCL 20/4

Several general formulas relating aerodynamic forces and moments acting on finite solid bodies immersed in a fluid to the time-variation of vorticity-moment integrals are presented. The formulas are valid for two-and three-dimensional flows and are shown to form a theory for aerodynamic forces and moments which encompasses much of the existing aerodynamic theories. Author (GRA)

N79-13011# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
EXPERIMENTAL MEASUREMENT OF PARACHUTE CAN-

OPY STRESS DURING INFLATION Final Report, 1 Jul. 1975 - 30 Dec. 1976
Peggy M. Wagner May 1978 185 p refs
(AF Proj. 6065)
(AD-A058474; AFFDL-TR-78-53) Avail: NTIS HC A09/MF A01 CSCL 01/3

The Omega sensor was developed for measuring stress in textile and other flexible materials by the Department of Aerospace Engineering and Mechanics of the University of Minnesota and sponsored by the Air Force Flight Dynamics Laboratory. Two studies were conducted by the University which indicated that the circumferential stresses of inflated parachute canopies indicated by Omega sensors agreed with theoretically predicted stresses and also that the stresses measured by an Omega sensor were not affected by dynamic loading. This particular study deals with an in-house test program, designed to measure the circumferential stresses of a model (five foot nominal diameter) ringslot parachute during inflation and at steady state using modified Omega sensors. Slight modifications to the original Omega sensor had to be made due to complications of the tabs tearing during preliminary testing. Five sensors were attached strategically to the canopy of a ringslot parachute and put through a series of low speed wind tunnel tests. The results are presented in detail and provide for the first time actual measurement of circumferential stresses on the surface of a model ringslot parachute. These results, however, can only present the general trend shown in the parachute's stress distribution and not actual stress values due to the inability to calibrate the sensor while attached to the canopy. Author (GRA)

N79-13012# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
HIGH SPEED FLOW SEPARATION AHEAD OF FINITE SPAN STEPS Final Report, Jul. 1974 - Jul. 1977
Louis G. Kaufman, II and Robert D. Kirchner Apr. 1978 77 p refs
(AD-A059074; AFFDL-TR-78-30) Avail: NTIS HC A05/MF A01 CSCL 20/4

Detailed surface heat transfer data, oil flow, and schlieren photographs are presented for high speed flow separation ahead of finite span, forward facing steps on flat plates. Step spans were varied from three to ten times as large as the step height, and the step heights are three to four times larger than the undisturbed turbulent boundary layer thickness. Reynolds numbers, based on plate length, were approximately 15 million for both Mach 4.75 and Mach 5.04 local undisturbed flows over the flat plate surface. For these test conditions, the maximum extent of separation ahead of the step is approximately 4.4 times as large as the step height independent of step span, and peak heating rates were measured that are more than six to eight times larger than the undisturbed flow heating rates. Peak heating on the plate surface occurs slightly upstream and approximately 1/2 step height inboard of the outboard sides of the steps; the increase in peak heat transfer coefficients over the undisturbed flow values decreases with increasing step span. In addition to presenting the detailed surface heat transfer data, a plausible theoretical analysis is presented for calculating the region of turbulent boundary layer separation ahead of these finite span steps. Author (GRA)

N79-13013# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A QUASI-TWO-DIMENSIONAL AERODYNAMIC FORCE MODEL FOR STAR-SHAPED BODIES AT HYPERSONIC VELOCITIES
Judson R. Baron and James E. Libby 10 Mar. 1978 54 p refs
(Contract F19628-78-C-0002)
(AD-A059086; TR-527; ESD-TR-78-32) Avail: NTIS HC A04/MF A01 CSCL 20/4

A theoretical framework is provided for determining the aerodynamic forces on star-shaped geometries during high-altitude re-entry flight. In effect, this involves the formulation of expressions for the viscous and pressure forces acting on wedges at various inclinations to the flow. Since the relatively high Mach numbers and low Reynolds numbers involved in early re-entry do not allow the classical separation of a flow field into a distinct boundary layer and inviscid shock layer, the method necessarily accounts for the considerable interaction effects and off-design conditions which are encountered. Consideration is given to both the theoretical methods suggested for evaluation of these viscous effects and their validity. Numerical results for star geometries indicate relatively good agreement with experimental data for angles of attack from 0 to 16 and Reynolds numbers from 1.6 x 10,000 to 2 x 1,000,000 at Mach 15 to 20. For still smaller Reynolds numbers, a free molecule force model furnishes a first approximation to behavior at very high altitudes. Author (GRA)

N79-13014# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
THE VISCOUS TRANSONIC FLOW OVER TWO-ELEMENT AIRFOIL SYSTEMS Interim Report, 1 Jan. - 30 Sep. 1977
G. Volpe and B. Grossman Aug. 1978 49 p refs
(Contract N00014-75-C-0722)
(AD-A058425; RE-558; ONR-CR215-241-2) Avail: NTIS HC A03/MF A01 CSCL 20/4

A numerical procedure has been developed to compute the transonic viscous-inviscid interacting flow field about airfoils with leading edge slats or trailing edge flaps. The inviscid theory utilizes conformal mappings in a full potential flow formulation, with analytic removal of singularities and a mixed flow relaxation procedure. The turbulent boundary layer is computed with methods based on a turbulent kinetic energy formulation and is coupled to the inviscid flow using surface source flow boundary conditions. Semiempirical methods are used to compute local strong interaction regions occurring in the vicinity of shock waves, trailing edges, and to account for flow separation. Our results are in good agreement with existing wind tunnel data for several typical two-element airfoil configurations. Author (GRA)

N79-13015# Goodyear Aerospace Corp., Akron, Ohio.
FEASIBILITY DESIGN STUDY FOR SCALE MODEL OF ZPG-X AIRSHIP Final Report
J. W. Lancaster Jun. 1978 75 p refs
(Contract N62269-77-M-4260; WF41411000)
(AD-A058624; GER-16558; NADC-77265-30) Avail: NTIS HC A04/MF A01 CSCL 01/3

This report documents a Feasibility Design Study of a scale model of the ZPG-X airship which would demonstrate the VTOL and hover capability of this vehicle concept. Author (GRA)

N79-13016# National Technical Information Service, Springfield, Va.
FLOW REATTACHMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1978
Guy E. Habercom, Jr. Nov. 1978 126 p Supersedes NTIS/PS-77/0988; NTIS/PS-76/0925
(NTIS/PS-78/1158/1; NTIS/PS-77/0988) Avail: NTIS HC $28.00/MF $28.00 CSCL 20D

A bibliography containing 120 abstracts concerning certain fluid flow conditions where, after boundary layer or flow separation has occurred, the flow attaches again to a surface is presented. The materials cover both laminar and turbulent boundary layers in gases and liquids, principally the former. Aerodynamic and gas flow research relates to subsonic, transonic, supersonic, and hypersonic speeds involving plane, curved, and cavity surfaces for various types of flow. Applications are to such forms as geometric shapes, ramps, wings, airfoils, and other bodies. Wind tunnel testing is described. Hydrodynamic and liquid flow data refer to jets and fluidic devices. Mathematical models and analyses are included. GRA

N79-13017# National Technical Information Service, Springfield, Va.
BOUNDARY LAYER CONTROL, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1975 - Sep. 1978
Guy E. Habercom, Jr. Oct. 1978 220 p Supersedes NTIS/PS-77/0989; NTIS/PS-76/0928; NTIS/PS-75/824
(NTIS/PS-78/1150/8; NTIS/PS-77/0989; NTIS/PS-76/0928; NTIS/PS-75/824) Avail: NTIS HC $28.00/MF $28.00 CSCL 20D

A bibliography containing 214 abstracts concerning aerodynamics, hydrodynamics, turbomachinery and liquid flow is presented. Discussions refer to components and configurations. Flow fields include subsonic, transonic, supersonic, and hypersonic. Analyses involve computerized simulations, mathematical models

and methods, and numerical solutions. Additional topics are temperature effects, mechanical responses, unsteady dynamics, and heat and mass transfer. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

No abstracts in this category.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N79-13018*# Ohio Univ., Athens. Avionics Engineering Center.
INITIAL FLIGHT TEST OF A LORAN-C RECEIVER/DATA COLLECTION SYSTEM
Joseph P. Fischer and James D. Nickum Nov. 1978 46 p refs
(Grant NGR-36-009-017)
(NASA-CR-157629; TM-64) Avail: NTIS HC A03/MF A01 CSCL 17G

Development of a low cost Loran C receiver for general aviation use is discussed. The preparation and procedure of a flight test conducted with a receiver design which utilizes a phase locked loop oscillator to track the Loran C signals is described. It is indicated that such a receiver is a viable alternative for future work in developing a low cost Loran-C navigator. J.M.S.

N79-13019*# Ohio Univ., Athens. Avionics Engineering Center.
LORAN-C TIME DIFFERENCE CALCULATIONS
Joseph P. Fischer Oct. 1978 10 p refs
(Grant NGR-36-009-017)
(NASA-CR-157957; TM-63) Avail: NTIS HC A02/MF A01 CSCL 17G

Some of the simpler mathematical equations which may be used in Loran-C navigation calculations were examined. A technique is presented to allow Loran-C time differences to be predicted at a location. This is useful for receiver performance work, and a tool for more complex calculations, such as position fixing. B.B.

N79-13020# Naval Research Lab., Washington, D. C. Space Applications Branch.
INITIAL RESULTS OF THE NAVSTAR GPS NTS-2 SATELLITE Interim Report
Roger L. Easton, James A. Buisson, and Thomas B. McCaskill 25 May 1978 26 p refs
(AD-A058591; AD-E000201; NRL-8232) Avail: NTIS HC A03/MF A01 CSCL 22/2

Navigation Technology Satellite 2 (NTS-2) was successfully launched on June 23, 1977, into a near-12-hour circular orbit. Precise frequency and timing signals are derived from the two cesium frequency standards. This report discusses the launch and preliminary results, which include verification of the relativistic clock effect. An international time-transfer experiment is planned, and a worldwide synchronization accuracy of less than 100 nanoseconds is anticipated, based on preliminary time-transfer results between Cape Kennedy and the U.S. Naval Observatory. A proposed NASA laser-tracking network will be used to verify the accuracy of the Global Positioning System (GPS) orbits. Author (GRA)

N79-13021# Sperry Rand Corp., Great Neck, N. Y.
SLIC-7 LASER GYRO INVESTIGATIONS Final Technical Report, Jul. - Dec. 1977
John Abdale and Werner Drexel Mar. 1978 88 p refs
(Contract F33615-77-C-1196)
(AD-A059028; SG-4240-1027; AFAL-TR-78-32) Avail: NTIS HC A05/MF A01 CSCL 17/7

This program is the initial phase of an effort to develop laser gyro technology for application to low cost inertial missile guidance systems. As part of the research and development effort two investigations of SLIC-7 laser gyro were conducted: (1) thermal analysis and (2) storage and shelf life evaluation. The key to quick reaction and performance stability is the design to minimize thermal gradients and, therefore, thermal sensitivities. Test results disclose that the thermal gradients across the discharge tubes are the key factors. Analyses indicate that the SLIC-7 gyro can meet the low thermal sensitivity goals and the storage and shelf life requirements postulated for the missile guidance systems. Author (GRA)

N79-13022# Arinc Research Corp., Annapolis, Md.
DEVELOPMENT AND EVALUATION OF SELECTIVE ADDRESS BEACON (SAB) SYSTEM Final Report
S. H. Kowalski Aug. 1978 117 p ref
(Contract DOT-FA76WA-3788)
(AD-A058457; Rept-1326-11-2-1734) Avail: NTIS HC A06/MF A01 CSCL 17/7

This report presents the results of the development and evaluation of a selective address beacon system intended to reduce or eliminate synchronous garble in dense airspace. Two concepts are developed and evaluated, depending on the expected application of SAB as either an interim or long-term solution of the synchronous garble problem. The degree of improvement expected from each concept is evaluated and the communications reliability is analyzed. Avionics designs supporting the concepts are developed and avionics cost estimated for the air carrier and general aviation classes of aircraft. Author (GRA)

N79-13023# Arinc Research Corp., Annapolis, Md.
INVESTIGATION OF THE FEASIBILITY OF USING THE DISCRETE ADDRESS BEACON SYSTEM DATA LINK FOR NON-ATC COMMUNICATIONS Final Report
S. H. Kowalski, E. R. Carbone, W. M. Kolb, and D. A. Swann Aug. 1978 77 p
(Contract DOT-FA76WA-3788)
(AD-A058453; Rept-1326-01-05-1792) Avail: NTIS HC A05/MF A01 CSCL 17/7

This report presents the results of a study to investigate the suitability of the DABS to support airline industry private communications between aircraft in flight and ground operations. The present, proposed near future, and possible future communication traffic is identified. DABS models for uplink traffic, downlink traffic, and message scheduling are developed and exercised over a broad spectrum of conditions for both en route and terminal area communications. A simulation is performed to determine the probable delays due to queuing for the various levels of implementation and with various numbers of aircraft. Author (GRA)

N79-13024# National Technical Information Service, Springfield, Va.
COLLISION AVOIDANCE SYSTEMS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jul. 1978
Guy E. Habercom, Jr. Aug. 1978 344 p Supersedes NTIS/PS-77/0765; NTIS/PS-76/0682; NTIS/PS-75/671; NTIS/PS-75/036
(NTIS/PS-78/0883/5; NTIS/PS-77/0765; NTIS/PS-76/0682; NTIS/PS-75/671; NTIS/PS-75/036) Avail: NTIS HC $28.00/MF $28.00 CSCL 01B

Collision avoidance systems in three modes of transportation (i.e. air, surface, marine) are investigated in these research reports. Traffic scheduling, automatic ground based stations, and onboard

warning systems are researched. Sensors and detectors relative to marine transportation collision avoidance engineering research relative to highway rail collision avoidance are covered. This updated bibliography contains 336 abstracts, 36 of which are entries to the previous edition GRA

N79-13025# National Technical Information Service, Springfield, Va.
INERTIAL NAVIGATION AND GUIDANCE. VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Jun. 1976 - Jun. 1978
William E. Reed Jul. 1978 167 p Supersedes NTIS/PS-77/0609; NTIS/PS-76/0552; NTIS/PS-75/436
(NTIS/PS-78/0735/7; NTIS/PS-77/0609; NTIS/PS-76/0552; NTIS/PS-75/436) Avail: NTIS HC $28.00/MF $28.00 CSCL 17G

The bibliography cites research reports on the design, development, performance, equipment, and applications of inertial navigation and guidance systems. Reports on strapdown systems are included. This updated bibliography contains 161 abstracts, 48 of which are new entries to the previous edition. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N79-13026*# General Dynamics/Convair, San Diego, Calif.
VEHICLE DESIGN EVALUATION PROGRAM (VDEP). A COMPUTER PROGRAM FOR WEIGHT SIZING, ECONOMIC, PERFORMANCE AND MISSION ANALYSIS OF FUEL-CONSERVATIVE AIRCRAFT, MULTIBODIED AIRCRAFT AND LARGE CARGO AIRCRAFT USING BOTH JP AND ALTERNATIVE FUELS
B. H. Oman Jan. 1977 426 p refs
(Contract NAS1-13285)
(NASA-CR-145070) Avail: NTIS HC A19/MF A01 CSCL 01C

The NASA Langley Research Center vehicle design evaluation program (VDEP-2) was expanded by (1) incorporating into the program a capability to conduct preliminary design studies on subsonic commercial transport type aircraft using both JP and such alternate fuels as hydrogen and methane;(2) incorporating an aircraft detailed mission and performance analysis capability; and (3) developing and incorporating an external loads analysis capability. The resulting computer program (VDEP-3) provides a preliminary design tool that enables the user to perform integrated sizing, structural analysis, and cost studies on subsonic commercial transport aircraft. Both versions of the VDEP-3 Program which are designated preliminary Analysis VDEP-3 and detailed Analysis VDEP utilize the same vehicle sizing subprogram which includes a detailed mission analysis capability, as well as a geometry and weight analysis for multibodied configurations. A.R.H.

N79-13027# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
PRELIMINARY AIRWORTHINESS EVALUATION EH-1H HELICOPTER QUICK FIX, PHASE 1A Final Report
Robert M. Buckanin and Jerry R. Guin Oct. 1977 46 p refs
(AD-A058785; USAAEFA-77-15) Avail: NTIS HC A03/MF A01 CSCL 01/3

The United States Army Aviation Engineering Flight Activity conducted a Preliminary Airworthiness Evaluation of the EH-1H Helicopter Quick Fix Phase 1A to determine the effects of the installation of the AN/ARQ-33 radio countermeasures system and its associated equipment on aircraft handling qualities. The helicopter was tested from 18 through 23 August 1977 at Naval Air Station, Pensacola, Florida. During the tests, nine flights totaling 8.5 productive flight hours were flown. The handling qualities of the EH-1H helicopter were determined to be satisfactory with the exception of inadequate directional control in right sideward flight. An enhancing characteristic noted was the simultaneous antenna retraction systems. Inadequate directional control at right sideward velocities between 5 and 15 knots true airspeed was a deficiency. Two shortcomings were noted: the susceptibility to damage of the right FM 10-120 homing antenna during preflight/maintenance operations and the susceptibility to damage of the FM 10-242 communications antenna during running takeoff/landing maneuvers.Author (GRA)

N79-13028# General Dynamics/Convair, San Diego, Calif.
BORON/ALUMINUM LANDING GEAR FOR NAVY AIRCRAFT Final Report, Jun. 1974 - Aug. 1977
Sep. 1978 129 p refs
(Contract N62269-74-C-0619)
(AD-A058888; CASD-NADC-76-003) Avail: NTIS HC A07/MF A01 CSCL 08/13

The program objective was to evaluate the application of boron/aluminum composite material to a typical Navy landing gear component, with primary emphasis upon evaluation of component reliability. A replacement composite drag link was designed using boron/aluminum tube construction to the required envelope, ultimate loads, fatigue spectrum, and carrier environment for the A-7 nose gear lower drag link. The resulting composite link design was a 28-ply boron/aluminum tube diffusion bonded to titanium end fittings. A test specimen was designed identical to the replacement composite drag link, except that simplified test end fittings replaced the complex flight fittings. A comprehensive stress analysis was conducted for both the replacement drag link and the test specimen. A finite-element computer analysis of the critical tube/fitting scarf joint was performed. Boron/aluminum links that had been damaged by pebble impact then subjected to a corrosive environment and notched, showed no reduction in static strength over an as-fabricated specimen and survived two lifetimes at 80% design fatigue load levels. This compared favorably with a notched 300M steel production link which failed in fatigue after 1.1 lifetimes at 70% design fatigue load levels. Both the boron/aluminum links and the 300M steel production link were notched and tested in the same sequence. GRA

N79-13029# Sikorsky Aircraft, Stratford, Conn.
PRELIMINARY DESIGN STUDY OF A TAIL ROTOR BLADE JETTISON CONCEPT Final Report
Robert A. Selleck Jul. 1978 266 p
(Contract DAAJ02-77-C-0004; DA Proj. 1L2-62209-AH-76)
(AD-A059239; SER-70280; USARTL-TR-78-28) Avail: NTIS HC A12/MF A01 CSCL 01/3

Loss of a significant portion of a tail rotor blade will cause severe imbalance of the tail rotor that can lead to secondary damage to the helicopter and possible injury to the occupants. A system that detects such blade loss and removes the imbalance by jettison of the residual portion of the damaged blade and its opposing blade can overcome the rotor imbalance and allow continued flight. Using the performance characteristics of the UH-60A BLACK HAWK helicopter, a prototype system was developed and its performance evaluated to determine the capability of the system to jettison rotor blades in a manner that would prevent secondary damage. Additionally, analyses were conducted to determine the dynamic stability characteristics of the UH-60A tail rotor in a two-bladed configuration and the ability of the helicopter to accommodate the loads developed during transition from four to two blades. Residual helicopter performance and the capability of the helicopter to be retrimmed following jettison of two opposing tail rotor blades was analyzed using the General Helicopter Flight Dynamic Model programmed on a PDP-10 Hybrid Computer. GRA

N79-13030# Textron Bell Helicopter, Ft. Worth, Tex.
EFFECT OF OPERATIONAL ENVELOPE LIMITS ON TEETERING ROTOR FLAPPING Final Report, Jun. 1976 - Aug. 1977
L. W. Dooley and S. W. Ferguson, III Jul. 1978 94 p refs
(Contract DAAJ02-76-C-0043; DA Proj. 1L2-62209-AH-76)
(AD-A059187; USARTL-TR-78-9) Avail: NTIS HC A05/MF A01 CSCL 01/3

The objectives of this study were to verify the accuracy of the hybrid computer version of the Rotorcraft Simulation Program C81 as a flapping predictor, to investigate the effect of operational envelope limits on flapping, and to investigate

methods of extending the recommended operational envelopes of the subject helicopter. GRA

N79-13031# United Technologies Corp., Stratford, Conn.
STRUCTURAL CONCEPTS AND AERODYNAMIC ANALYSIS FOR LOW RADAR CROSS SECTION (LRCS) FUSELAGE CONFIGURATIONS Final Report
David W. Lowry, Melvin J. Rich, Saul Rivera, and Thomas W. Sheehy Jul. 1978 142 p refs
(Contract DAAJ02-76-C-0062; DA Proj. 1F2-62209-AH-76)
(AD-A058906; SER-50987; USARTL-TR-78717) Avail: NTIS HC A07/MF A01 CSCL 01/3

The objectives of this study were: (1) to develop structural concepts for three low radar cross section (LRCS) fuselage configurations constructed of conventional materials; (2) to determine the effects of these concepts on the weight, cost, fail-safety, and maintainability of the three configurations; (3) to compare these findings with those of a baseline UH-60A helicopter, and thus select the structural concept that is the lowest in weight and cost and the easiest to maintain; (4) to assess the application of advanced materials for each configuration; (5) to identify high technical risk areas; (6) to develop overall design tranding data for helicopters, using the three fuselage configurations of conventional and advanced materials; (7) to conduct an analytical investigation of the aerodynamic loads, vertical drag and mission performance of the three low radar cross section (LRCS) configurations; and (8) to compare these findings with those of the baseline UH-60 helicopter. Structural concepts developed for the three LRCS configurations showed that extensive reshaping, as exemplified by Configuration 2, would increase fuselage weight from that of the baseline UH-60A fuselage by 223 pounds and cost by 3.65 percent. When advanced materials were used, Configuration 2 decreased from the baseline fuselage weight and cost by 118 pounds and 3.98 percent respectively. GRA

N79-13032# Rockwell International Corp., Los Angeles, Calif.
NEW CONCEPTS IN COMPOSITE MATERIAL LANDING GEAR FOR MILITARY AIRCRAFT. VOLUME 1: TECHNICAL DISCUSSION Final Report, Apr. 1976 - Feb. 1978
V. E. Wilson Wright-Patterson AFB, Ohio AFFDL Feb. 1978 164 p 2 Vol.
(Contract F33615-76-C-3021; AF Proj. 2402)
(AD-A058529; AFFDL-TR-78-2-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 11/14

Phase 1 effort included the selection of the B-1 Nose Gear as the baseline landing gear system and the conceptual design and evaluation of three concepts using composite material hardware. One concept was constrained by form, fit and function, one by fit and function, and the third by function only. The most effective gains in the use of composite material was when design freedom was increased and only the function constraint was used. Phase 2 effort was redirected as a result of the Phase 1 results, and the main landing gear for the ATS advanced fighter, which is in the preliminary design stage, was selected as the baseline since it required only the function constraint. The scope of materials studied was increased, and Metal Matrix Composites and Advanced Metallics were studied, as well as Organic Advanced Composites. Designs were made, analyzed, and evaluated for each concept. GRA

N79-13033# Rockwell International Corp., Los Angeles, Calif. Aircraft Div.
NEW CONCEPTS IN COMPOSITE MATERIAL LANDING GEAR FOR MILITARY AIRCRAFT. VOLUME 2: APPENDICES Final Report, Apr. 1976 - Feb. 1978
V. E. Wilson Wright-Patterson AFB, Ohio AFFDL Feb. 1978 250 p refs 2 Vol.
(Contract F33615-76-C-3021; AF Proj. 2402)
(AD-A058672; AFFDL-TR-78-2-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 11/4

This report describes the effort conducted on Phase 1 of the two-phase Air Force Contract 'New Concepts in Composite Material Landing Gear for Military Aircraft.' This Phase 1 section was structured to determine the maximum practical use of composite material for landing gear hardware under three specific sets of constraints. GRA

N79-13034# Southwest Research Inst., San Antonio, Tex.
DEVELOPMENT OF A BLAST SIMULATOR FOR TESTING SIMULATED AIRCRAFT FUEL TANKS Final Report, Sep. 1976 - Dec. 1976
E. D. Esparza and A. B. Wenzel Jul. 1978 54 p refs
(Contract DAAD05-76-C-0726)
(AD-A058816; SwRI-02-4374; JTCG/AS-76-T-004) Avail: NTIS HC A04/MF A01 CSCL 19/4

Anti-aircraft missile warheads pose a severe threat to aircraft even when the missile misses the aircraft. The threat from missile warheads can be divided into two primary areas for proximity detonation, fragments and blast. This report describes the development, calibration, and testing of a blast simulator capable of varying the blast parameters (i.e., pressure, impulse, and time duration), simulating those obtained at various standoff distances from a prototype warhead detonation. Author (GRA)

N79-13035# Modern Analysis, Inc., Ridgewood, N. J.
RELIABILITY-BASED SCATTER FACTORS. VOLUME 1: THEORETICAL AND EMPIRICAL RESULTS Final Report, Mar. 1977 - Mar. 1978
Masanobu Shinozuka Mar. 1978 81 p refs
(Contract F33615-77-C-3055; AF Proj. 2304)
(AD-A058525; AFFDL-TR-78-17-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 01/3

A definition of scatter factor is introduced that is rational and at the same time can directly be related to the reality of aircraft design and certification as well as of the full-scale and also coupon fatigue test of structural elements or components. Specifically, the scatter factor is defined as the ratio of the MLE (maximum likelihood estimate) of the scale parameter of the two-parameter Weibull distribution assumedly describing the life distribution of structural elements or components, to the time to first failure among a fleet of nominally identical elements of components subjected also to nominally identical operating conditions. Freudenthal has used the same definition of the scatter factor, however, under much simplified conditions: He assumes that the shape parameter of the Weibull distribution is known. Unfortunately, however, such an assumption is inconsistent with the reality where the Weibull shape parameter easily ranges from 2.0 to 10.0 reflecting the fact that structural elements or components suffer from a variety of sources of randomness in fatigue strength; not only from the probabilistic variation of the material property but also from the statistical variation in workmanship associated with, for example, drilling rivet holes in the process of airframe fabrications. GRA

N79-13200# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ENERGY CONSERVATION AIRCRAFT DESIGN AND OPERATIONAL PROCEDURES
Philippe Poisson-Quinton *In* AGARD Aircraft Eng. Future Fuels and Energy Conserv. Sep. 1978 47 p refs (For primary document see N79-13192 04-28)
Avail: NTIS HC A09/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N79-13036*# United Technologies Corp., Stratford, Conn. Sikorsky Div.
HELICOPTER MISSION OPTIMIZATION STUDY Final Report
John R. Olson Dec. 1978 122 p refs
(Contract NAS1-1498)
(NASA-CR-3060) Avail: NTIS HC A05/MF A01 CSCL 01D

The feasibility of using low-cost, portable computer technology to help a helicopter pilot optimize flight parameters to minimize fuel consumption and takeoff and landing noise was demonstrated. Eight separate computer programs were developed for use in the helicopter cockpit using a hand-held computer. The programs provide the helicopter pilot with the ability to calculate

power required, minimum fuel consumption for both range and endurance, maximum speed and a minimum noise profile for both takeoff and landing. Each program is defined by a maximum of two magnetic cards. The helicopter pilot is required to key in the proper input parameter such as gross weight, outside air temperature or pressure altitude. G.G.

N79-13037# McDonnell Aircraft Co., St. Louis, Mo.
VARIABLE ACUITY DISPLAY DEVELOPMENT. VOLUME 1: BASIC PROGRAM Final Report
R. W. Fisher, R. Helmick, G. Licis, and A. Rosenfeld Wright-Patterson AFB, Ohio AFAL Aug. 1977 93 p refs 2 Vol.
(Contract F33615-76-C-1031; AF Proj. 2004)
(AD-A059015; AFAL-TR-77-156-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 14/2

A small compact direct view display was designed and fabricated for the Variable Acuity Remote Viewing System. This display is 20 times smaller, 50 times brighter, and has 3 times better resolution than the only other existing display for the system, a real image projection display. Author (GRA)

N79-13038# McDonnell Aircraft Co., St. Louis, Mo.
VARIABLE ACUITY DISPLAY DEVELOPMENT. VOLUME 2: INFRARED LENS FEASIBILITY STUDY Final Report
R. W. Fisher, R. Helmick, G. Licis, and A. Rosenfeld Wright-Patterson AFB, Ohio AFAL Aug. 1977 76 p refs 2 Vol.
(Contract F33615-76-C-1031; AF Proj. 2004)
(AD-A058458; AFAL-TR-77-156-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 14/2

The feasibility of designing a nonlinear lens capable of operating with second generation infrared monolithic focal plane detector arrays has been established. The feasibility was based on a computer performance model which evaluated the effect of 3 to 5 micron or 8 to 14 micron infrared imaging spectrum, the number of scan lines, F/number, lens blur, and scanner type. In addition, the effects of narcissus were determined which resulted in requirements on lens element location. The results indicate that such a lens could be built and should operate in the 8 to 14 micron spectral region. It would have an 8 inch clear aperture and would have resolution and field-of-view adequate to support human vision. In addition, it could be constructed with state-of-art techniques and materials.
Author (GRA)

N79-13039# Naval Avionics Center, Indianapolis, Ind.
REPORT ON MODULAR AVIONIC PACKAGING (MAP) INDUSTRY BRIEFING AND RESPONSE Interim Report
John R. Kidwell 9 Aug. 1978 182 p
(WF54580000)
(AD-A059193; NAC-TR-2240) Avail: NTIS HC A09/MF A01 CSCL 13/4

This report provides information related to a modular avionic packaging (MAP) concept presented to industry on 9 May 1978 at the Naval Avionics Center, Indianapolis, Indiana. In attendance at this meeting were 78 representatives of different divisions of 33 companies. As major suppliers of avionics to the Navy, comments provided by these companies were anticipated to be very useful in the further development of packaging approaches for future avionics. This report contains the responses provided by industry. Although the companies responding are identified by name for reference, a reasonable attempt has been made to render the comments anonymous by removing company names and product references. The comments have been grouped into categories and summarized; however, no attempt has been made in this report to resolve areas of conflicting opinion given by different companies. It is not intended to imply that the Navy or this Center endorses, agrees, or disagrees in any manner with the comments provided by industry. Author (GRA)

N79-13040# Telcom, Inc., Arlington, Va.
ANALYSIS OF THE PROJECTED OPERATIONAL EFFECTIVENESS OF DEVELOPMENTAL WEAPON CONTROL AVIONICS HARDWARE Final Report
25 Jan. 1978 20 p refs
(Contract N00019-77-C-0110)
(AD-A058555) Avail: NTIS HC A02/MF A01 CSCL 19/5

This project was in the formative stage throughout most of the period during which TSI carried out its analysis. These efforts were tailored toward the VAMX platform which was a conceptual all-weather attack aircraft. During the requirements determination phase of this effort, TSI created and presented a briefing on potential VAMX technical and operational problems. The principal focus of this briefing was the problems associated with the conduct of close air support/battlefield interdiction in a dense environment such as central Europe. There are a number of very complex problems associated with the close air support/battlefield interdiction mission in a dense environment for which there are no solutions currently in hand. For instance, there is the problem of the extremely large number of targets and very dense ground-to-air defense environment which is associated with central Europe scenarios. GRA

N79-13041# Army Aeromedical Research Lab., Fort Rucker, Ala.
HEAD AIMING/TRACKING ACCURACY IN A HELICOPTER ENVIRONMENT
Robert W. Verona May 1978 8 p
(AD-A058444) Avail: NTIS HC A03/MF A01 CSCL 01/3

This experiment was conducted to measure man's head aiming/tracking capability using a helmet mounted sighting device. The influences of target speed, helmet suspension types and helmet weighting parameters on head aiming/tracking were investigated. If the aiming/tracking accuracy was sensitive to manipulation of these man-machine interface parameters, then it would seem to indicate that improved aiming/tracking accuracy could be obtained by improving the interface. GRA

N79-13042# Human Engineering Labs., Aberdeen Proving Ground, Md.
HEL PARTICIPATION IN THE PLAN FOR ASSISTING IN THE DEFINITION OF ARMY HELICOPTER ELECTRO-OPTICAL SYMBOLOGY Interim Report
Andrew T. Buckler Jun. 1978 53 p refs
(AD-A058730; HEL-TN-1-78) Avail: NTIS HC A04/MF A01 CSCL 01/3

This is an interim report on progress made thus far toward optimization of symbology for electro-optical flight displays in Army aircraft. The Army aviation community adopted a plan in late 1977 aimed at determining standardization requirements and optimal symbology formats. At this time, a literature review, a task analysis and trade-off analysis have been completed while a time-line analysis, information conflict identification, an analysis of flight modes and evaluation criteria development are all in progress. This report provides a summary of the program tasks listed above as well as a review of concurrent efforts toward defining symbology for the pilot night vision system in the Advanced Attack Helicopter. Author (GRA)

N79-13043# Hughes Research Labs., Malibu, Calif.
HOLOGRAPHIC LENS FOR PILOT'S HEAD UP DISPLAY, PHASE 4 Final Report, 25 Mar. 1976 - 25 Mar. 1977
A. Au, A. Graube, and L. G. Cook Aug. 1978 66 p refs
(Contract N62269-76-C-0188)
(AD-A058660; NADC-78191-60) Avail: NTIS HC A04/MF A01 CSCL 14/5

This report describes work done to design and fabricate a holographic lens for pilot's head up display. A holographic head up display (HHUD) trade-off study was done to minimize weight and size of the HHUD. This led to a design for a 25 H x 18 V FOV system with a 3.5 in. (89 mm) circular exit pupil at an eye relief of 26 in. (660 mm). A new design concept was used to reduce the complexity of the relay lens system to a five element asymmetric design. Final system optimization reduced typical errors to 2-5 mrad. Relayless HHUD and holographic relay lens designs were investigated and found to provide moderate FOV and performance, limited by uncorrected hologram aberrations. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N79-13044*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

COMPARISON OF CALCULATED AND ALTITUDE-FACILITY-MEASURED THRUST AND AIRFLOW OF TWO PROTOTYPE F100 TURBOFAN ENGINES

Frank Kurtenbach Dec. 1978 29 p refs

(NASA-TP-1373; H-1015) Avail: NTIS HC A03/MF A01 CSCL 21E

A comparison is made of the facility performance data for the two engines with an engine performance model, and it provides corrections that can be applied to the model so that it represents the test engines accurately over the flight envelope. Test conditions ranged from Mach numbers of 0.80 to 2.00 and altitudes from 4020 meters to 15,240 meters. Two distortion screens were used to determine the effect of distortion on airflow. Reynolds number effects were also determined. Engine hysteresis is documented, as is an attempt to determine engine degradation. The calibrated engine model had a twice standard deviation accuracy of approximately 1.24 percent for corrected airflow and 2.38 percent for gross thrust. L.S.

N79-13045*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.

MEASUREMENTS AND PREDICTIONS OF FLYOVER AND STATIC NOISE OF A TF30 AFTERBURNING TURBOFAN ENGINE

Frank W. Burcham, Jr., Paul L. Lasagna, and Stanley C. Oas (Boeing Com. Airplane Co.) Dec. 1978 94 p refs

(NASA-TP-1372; H-1017) Avail: NTIS HC A05/MF A01 CSCL 21E

The noise of the TF30 afterburning turbofan engine in an F-111 airplane was determined from static (ground) and flyover tests. A survey was made to measure the exhaust temperature and velocity profiles for a range of power settings. Comparisons were made between predicted and measured jet mixing, internal, and shock noise. It was found that the noise produced at static conditions was dominated by jet mixing noise, and was adequately predicted by current methods. The noise produced during flyovers exhibited large contributions from internally generated noise in the forward arc. For flyovers with the engine at nonafterburning power, the internal noise, shock noise, and jet mixing noise were accurately predicted. During flyovers with afterburning power settings, however, additional internal noise believed to be due to the afterburning process was evident; its level was as much as 8 decibels above the nonafterburning internal noise. Power settings that produced exhausts with inverted velocity profiles appeared to be slightly less noisy than power settings of equal thrust that produced uniform exhaust velocity profiles both in flight and in static testing. B.B.

N79-13046*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LOW-CYCLE FATIGUE OF THERMAL-BARRIER COATINGS AT 982 DEG C

Albert Kaufman, Curt H. Liebert, and Alfred J. Nachtigall Dec. 1978 20 p refs

(NASA-TP-1322; E-9688) Avail: NTIS HC A02/MF A01 CSCL 21E

The low-cycle fatigue lives of ZrO2-NiCrAlY and Al2O3-ZrO2-NiCrAlY thermal-barrier coatings in air at 982 C were determined from cyclic flexural tests of coated TAZ-8A strips. Strains were computed as a function of specimen displacements from a nonlinear, three-dimensional stress analysis program. Fatigue resistances of thermal-barrier coatings applied to the strips were compared with those of uncoated and NiCrAlY-coated strips. The results indicate that ZrO2 is about four times greater in fatigue life than TAZ-8A at 982 C, that ZrO2 would probably retain that fatigue strength up to 1316 C, and that adding an outer coat of Al2O3 to ZrO2 is neither beneficial nor detrimental to fatigue resistance. Author

N79-13047*# Borst (Henry V.) and Associates, Wayne, Pa.

A NEW BLADE ELEMENT METHOD FOR CALCULATING THE PERFORMANCE OF HIGH AND INTERMEDIATE SOLIDITY AXIAL FLOW FANS

Henry V. Borst Nov. 1978 51 p refs

(Contract NAS2-9079)

(NASA-CR-3063) Avail: NTIS HC A04/MF A01 CSCL 21E

A method is presented to design and predict the performance of axial flow rotors operating in a duct. The same method is suitable for the design of ducted fans and open propellers. The unified method is based on the blade element approach and the vortex theory for determining the three dimensional effects, so that two dimensional airfoil data can be used for determining the resultant force on each blade element. Resolution of this force in the thrust and torque planes and integration allows the total performance of the rotor, fan or propeller to be predicted. Three different methods of analysis, one based on a momentum flow theory; another on the vortex theory of propellers; and a third based on the theory of ducted fans, agree and reduce cascade airfoil data to single line as a function of the loading and induced angle of attack at values of constant inflow angle. The theory applies for any solidity from .01 to over 1 and any blade section camber. The effects of the duct and blade number can be determined so that the procedure applies over the entire range from two blade open propellers, to ducted helicopter tail rotors, to axial flow compressors with or without guide vanes, and to wind tunnel drive fans. Author

N79-13048*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

DEFINITION STUDY FOR VARIABLE CYCLE ENGINE TESTBED ENGINE AND ASSOCIATED TEST PROGRAM

Final Report

John W. Vdoviak Nov. 1978 112 p

(Contract NAS3-20582A)

(NASA-CR-159459; R78AEG551) Avail: NTIS HC A06/MF A01 CSCL 21E

The product/study double bypass variable cycle engine (VCE) was updated to incorporate recent improvements. The effect of these improvements on mission range and noise levels was determined. This engine design was then compared with current existing high-technology core engines in order to define a subscale testbed configuration that simulated many of the critical technology features of the product/study VCE. Detailed preliminary program plans were then developed for the design, fabrication, and static test of the selected testbed engine configuration. These plans included estimated costs and schedules for the detail design, fabrication and test of the testbed engine and the definition of a test program, test plan, schedule, instrumentation, and test stand requirements. Author

N79-13049*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COLD-AIR PERFORMANCE OF FREE POWER TURBINE DESIGNED FOR 112-KILOWATT AUTOMOTIVE GAS-TURBINE ENGINE 3: EFFECT OF STATOR VANE END CLEARANCES ON PERFORMANCE

Milton G. Kofskey and Kerry L. McLallin Dec. 1978 41 p refs

(Contract EC-77-A-31-1011)

(NASA-TM-78956; DOE/NASA/1011-78/29) Avail: NTIS HC A03/MF A01 CSCL 21A

An experimental investigation of a free power turbine designed for a 112-kW, automotive, gas turbine engine was made to determine the penalty in performance due to the stator vane end clearances. Tests were made over a range of mean section stator vane angles from 26 deg to 50 deg (as measured from the plane of rotation) with the vane end clearances filled. These results were compared with test results of the same turbine with vane end clearances open. At design equivalent values of rotative speed and pressure ratio and at a vane angle of 35 deg, the mass flow with the vane and clearances filled was about 8 percent lower than mass flow with vane end clearances open. The decrease in mass flow was mitigated by increasing the

vane angle. With the vane end clearances filled, there was about a 66 percent reduction in mass flow when the vane angle was decreased from 40 deg to 26 deg. For the same decrease in vane angle the stator throat area decreased by about 50 percent. This result indicates that the rotor losses were increasing with decreasing vane angle. B.B.

N79-13050*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

ANALYTICAL EVALUATION OF THE IMPACT OF BROAD SPECIFICATION FUELS ON HIGH BYPASS TURBOFAN ENGINE COMBUSTORS Final Report

R. P. Lohmann, E. J. Szetela, and A. Vranos Dec. 1978 161 p refs

(Contract NAS3-20802)

(NASA-CR-159454; PWA-5565-15) Avail: NTIS HC A08/MF A01 CSCL 21E

The impact of the use of broad specification fuels on the design, performance durability, emissions and operational characteristics of combustors for commercial aircraft gas turbine engines was assessed. Single stage, vorbix and lean premixed prevaporized combustors, in the JT9D and an advanced energy efficient engine cycle were evaluated when operating on Jet A and ERBS (Experimental Referee Broad Specification) fuels. Design modifications, based on criteria evolved from a literature survey, were introduced and their effectiveness at offsetting projected deficiencies resulting from the use of ERBS was estimated. The results indicate that the use of a broad specification fuel such as ERBS, will necessitate significant technology improvements and redesign if deteriorated performance, durability and emissions are to be avoided. Higher radiant heat loads are projected to seriously compromise liner life while the reduced thermal stability of ERBS will require revisions to the engine-airframe fuel system to reduce the thermal stress on the fuel. Smoke and emissions output are projected to increase with the use of broad specification fuels. While the basic geometry of the single stage and vorbix combustors are compatible with the use of ERBS, extensive redesign of the front end of the lean premixed prevaporized burner will be required to achieve satisfactory operation and optimum emissions. G.G.

N79-13051# AiResearch Mfg. Co., Phoenix, Ariz.

VARIABLE GEOMETRY TORQUE CONVERTER Final Report, Mar. 1976 - Nov. 1977

K. W. Benn and G. L. Perrone 10 Apr. 1978 159 p

(Contract F33615-76-C-2013; AF Proj. 3145)

(AD-A058603; AiResearch-31-2775A; AFAPL-TR-78-18) Avail: NTIS HC A08/MF A01 CSCL 10/2

Program objective was to design and evaluate a breadboard variable reactor system using the B-1 secondary power system torque converter. Results of the evaluation indicate that a variable reactor can be used in a small, high-speed torque converter to control input and output power schedules, during an acceleration between speed ratios from zero to approximately 0.9. GRA

N79-13052# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.

ANALYSIS OF WATER INGESTION EFFECTS IN AXIAL FLOW COMPRESSORS Final Report, 1 Sep. 1976 - Nov. 1977

S. N. B. Murphy, B. A. Reese, G. T. Arcangeli, and T. Tsuchiya Jun. 1978 99 p refs

(Contract F33615-74-C-2014; AF Proj. 3048)

(AD-A059025; M-WPAFB-T-76-1; AFAPL-TR-78-35) Avail: NTIS HC A05/MF A01 CSCL 13/7

In the study of the general problem of predicting performance and instability of installed jet engines during water ingestion (deliberate or accidental), the establishment of the behavior of the compressor in an engine is an important task. In continuation of an earlier study, this report includes (1) analysis of selected compressors with water ingestion and evaporation, (2) effect of bleed and/or injection, and (3) further development of a two-phase model with three droplet sizes for calculating compressor performance. An important result of investigations on selected compressors is the crucial influence of the location of water evaporation in the compressor and the blade loading. A second significant outcome of the investigations is that in order to simulate the engine with two-phase flow component responses are required in great detail. Author (GRA)

N79-13053# Systems Control, Inc., Palo Alto, Calif.

ADVANCED FAULT DETECTION AND ISOLATION METHODS FOR AIRCRAFT TURBINE ENGINES Engineering Technical Report, 1 Jan. 1976 - 1 May 1977

Ronald L. DeHoff and W. Earl Hall, Jr. 1 Feb. 1978 95 p refs

(Contract N00014-76-C-0420)

(AD-A058891; ONR-CR215-245-1) Avail: NTIS HC A05/MF A01 CSCL 21/5

Aircraft engine diagnostic methods are reviewed. The role of computer-aided diagnostic procedures for current and future engines is discussed from the aspects of performance monitoring, trending, and fault detection/isolation. Development of advanced maximum likelihood or regression algorithms for each of these is presented. A methodology is developed for applying these algorithms to models derived from engine test stand or flight data. Specific computational results are given for a high performance turbofan engine. Author (GRA)

N79-13054# Cornell Univ., Ithaca, N. Y.

RESEARCH ON HELICOPTER ROTOR NOISE Final Report, 1 Mar. 1975 - 15 Jun. 1978

A. R. George 15 Aug. 1978 19 p refs

(Grant DAHC04-75-G-0120)

(AD-A058388; ARO-12716.1-E) Avail: NTIS HC A02/MF A01 CSCL 20/1

Research was conducted on aspect of noise generation by helicopters. A general review of helicopter noise was prepared and published as one part of the work. Methods were developed for the analysis of high frequency broadband noise from rotors. Physical and analytical approximations were devised which allow practical calculation of noise from various loading mechanisms. Atmospheric turbulence noise was investigated including some effects of inflow distribution. A method for predicting trailing edge noise for rotors was developed. The results show that trailing edge noise can be quite important at high frequencies when the small scale components of ingested turbulence are weak compared to those of the blade boundary layer turbulence. In the area of high speed noise from high Mach number advancing blades the research was primarily concentrated on the radiated sound from the Lighthill stress associated with the occurrence of unsteady shock formation and disappearance on advancing transonic rotor blades. A simplified model of an impulsively started and stopped shock was used as the known near field in order to find the far field radiation. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N79-13055*# Franklin Research Center, Philadelphia, Pa.

DESIGN AND TEST OF THE 172K FLUIDIC RUDDER Final Report, Apr. 1977 - Oct. 1978

Charles A. Belsterling Oct. 1978 44 p refs

(Contract NAS1-14893)

(NASA-CR-158974; F-C4705) Avail: NTIS HC A03/MF A01 CSCL 01C

Progress in the development of concepts for control of aircraft without moving parts or a separate source of power is described. The design and wind tunnel tests of a full scale fluidic rudder for a Cessna 172K aircraft, intended for subsequent flight tests were documented. The 172K fluidic rudder was designed to provide a control force equivalent to 3.3 degrees of deflection of the conventional rudder. In spite of an extremely thin airfoil, cascaded fluidic amplifiers were built to fit, with the capacity for generating the required level of control force. Wind tunnel tests demonstrated that the principles of lift control using ram air power are sound and reliable under all flight conditions. The tests also demonstrated that the performance of the 172K fluidic rudder is not acceptable for flight tests until the design of the

scoop is modified to prevent interference with the lift control phenomenon. B.B.

N79-13066*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
FLIGHT COMPARISON OF THE TRANSONIC AGILITY OF THE F-111A AIRPLANE AND THE F-111 SUPERCRITICAL WING AIRPLANE
Edward L. Friend and Glenn M. Sakamoto Dec. 1978 78 p refs
(NASA-TP-1368; H-985) Avail: NTIS HC A05/MF A01 CSCL 01C

A flight research program was conducted to investigate the improvements in maneuverability of an F-111A airplane equipped with a supercritical wing. In this configuration the aircraft is known as the F-111 TACT (transonic aircraft technology) airplane. The variable-wing-sweep feature permitted an evaluation of the supercritical wing in many configurations. The primary emphasis was placed on the transonic Mach number region, which is considered to be the principal air combat arena for fighter aircraft. An agility study was undertaken to assess the maneuverability of the F-111A aircraft with a supercritical wing at both design and off-design conditions. The evaluation included an assessment of aerodynamic and maneuver performance in conjunction with an evaluation of precision controllability during tailchase gunsight tracking tasks. Author

N79-13067*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A NONLINEAR TRAJECTORY COMMAND GENERATOR FOR A DIGITAL FLIGHT-CONTROL SYSTEM
Luigi S. Cicolani and Stein Weissenberger Nov. 1978 114 p refs
(NASA-TP-1221; A-7074) Avail: NTIS HC A06/MF A01 CSCL 01C

Operational application of the command generator (CG) was examined in detail in a simulation of a flight control system with the augmentor wing jet STOL research aircraft. The basic repertoire of single axis maneuvers and operational constraints are discussed, and the system behavior is tested on a rigorous STOL approach path and as affected by various approximations in the CG synthesis and types of disturbances found in the operational environment. The simulation results indicate that a satisfactory nonlinear system with general maneuvering capabilities throughout the flight envelope was developed which satisfies the basic design objectives while maintaining a practicable degree of simplicity. Author

N79-13068# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
CONTROL ASPECTS OF HIGHLY CONSTRAINED GUIDANCE TECHNIQUES M.S. Thesis
Louis Russell Records, Jr. Feb. 1978 202 p refs
(AD-A058475; AFIT-CI-79-70) Avail: NTIS HC A10/MF A01 CSCL 22/4

This thesis examines the design of the guidance, steering, control, and attitude measurement systems for the third stage of a space vehicle in exoatmospheric powered flight. The guidance methods used in this study include position offset guidance and energy management (fuel depletion) guidance. A generalized flight control system design method is developed which allows the autopilot filter gains and coefficients to be readily determined for any desired crossover frequency. Several steering modes for velocity-to-be-gained and fuel depletion guidance are then discussed. The effect of terminal steering on the end-of-burn stability and velocity-to-be gained residuals is discussed for abrupt thrust termination and thrust tailoff conditions. An empirical approach to the determination of sensitivities to thrust direction errors for fuel depletion and simultaneous control of reentry angle and time-on-target guidance is discussed and compared to analytical predictions. Finally, an attitude measurement study is presented which compares several methods of processing the IMU attitude measurements with regard to reducing computational requirements and minimizing worst-case error. GRA

N79-13069# Honeywell, Inc., St. Louis Park, Minn. Avionics Div.
INVESTIGATION OF A LOW-COST SERVOACTUATOR FOR HYSAS Final Report, Apr. 1977 - Mar. 1978
James O. Hedeen Jul. 1978 88 p
(Contract DAAJ02-77-C-0025; DA Proj. 1L1-62114-AH-73)
(AD-A059188; HONEYWELL-W0597-FR; USARTL-TR-78-30)
Avail: NTIS HC A05/MF A01 CSCL 13/9

This document covers the design and testing of a fluidic input servoactuator to perform the series servoactuator function in a helicopter hydrofluidic stability augmentation system (HYSAS). The servoactuator consists of a two-stage fluidic amplifier cascade driving a conventional spool valve that positions a spring-centered cylinder. Simplicity and minimum cost commensurate with essential servoactuator performance was the design goal. A breadboard model servoactuator was designed, fabricated, and bench tested to evaluate feasibility. Servoactuator performance objectives were met at nominal supply conditions, but not over the complete operational oil temperature range. Author (GRA)

N79-13080# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STABILIZATION TECHNIQUES FOR IMPROVED RESPONSE OF THE F-15 AIRCRAFT M.S. Thesis
Steven Lew Whitemarsh Jun. 1978 160 p refs
(AD-A058514; AFIT/GGC/EE/78-6) Avail: NTIS HC A08/MF A01 CSCL 01/1

The purpose of this study was to show that by moving an aircraft's center-of-gravity aft of the aerodynamic neutral point, thus making it statically unstable, the use of a feedback control system produces a more responsive stable aircraft. Pitch rate, normal acceleration, and angle-of-attack rate were used as the feedback parameters in a pitch orientational control system having two feedback loops. The inner loop was used to improve the dynamic response characteristics and the outer loop to stabilize the aircraft. While all three types of feedback control were able to improve the aircraft response, the pitch rate feedback system had the least response variation between five different flight test conditions and provided the best overall system improvement. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N79-13061*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESCRIPTION AND PRELIMINARY CALIBRATION RESULTS FOR THE LANGLEY HYPERSONIC CF4 TUNNEL
R. E. Midden and C. G. Miller Nov. 1978 48 p refs
(NASA-TM-78800) Avail: NTIS HC A03/MF A01 CSCL 14B

A detailed description of the hypersonic CF4 tunnel is presented along with discussion of the basic components, instrumentation, and operating procedure. Operational experience with the CF4 reclaimer and lead-bath heater is discussed. Comparison of measured and predicted shock detachment distance on a sphere and pressure distributions measured on a sharp leading-edge flat plate revealed the absence of significant flow nonuniformity and lent creditability to predicted free stream flow conditions. The economic operation of this facility centers about the CF4 reclaimer, which was designed to operate at an efficiency of 90 to 95 percent. A number of modifications were made to the reclaimer system to improve its performance, and presently, the system reclaims approximately 75 percent of the test gas. Even with current budgetary constraints, this efficiency permits the CF4 tunnel to be operated as a viable research wind tunnel. G.G.

N79-13062# Royal Aircraft Establishment, Bedford (England).
THE USE OF SOUND ABSORBING WALLS TO REDUCE DYNAMIC INTERFERENCE IN WIND TUNNELS
Dennis G. Mabey 30 Mar. 1978 41 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in

Mar. 1979
Avail: NTIS HC A03/MF A01

A scheme for reducing dynamic interference at subsonic and transonic speeds was tested in two wind tunnels. Two types of dynamic interference were considered: excitation of unwanted acoustic resonances within the working section, and flow unsteadiness. The tests showed that both types of interference could be substantially reduced by replacing the conventional hard walls of a closed or a slotted working section by appropriate sound absorbing walls. The models used to establish the resonances in the working sections with hard walls were circular cylinders operating in the subcritical Reynolds number range (R sub d is less than 200,000) and thus generating discrete pressure fluctuations at the vortex shedding frequency. When the resonances were suppressed by the wall material the pressure fluctuations agreed well with previous measurements made in a much larger, low speed wind tunnel, nd with predictions. The investigation in the larger tunnel also showed the superiority of sound absorbing walls for buffeting measurements. Author

N79-13063# Naval Air Test Center, Patuxent River, Md.
A PROGRAM FOR DETERMINING FLIGHT SIMULATOR FIELD-OF-VIEW REQUIREMENTS
R. Yeend and D. Carico 13 Sep. 1978 13 p refs
(AD-A058932; NATC-TM-78-1RW) Avail: NTIS HC A02/MF A02 CSCL 09/2

This memorandum discusses a test approach for determining the optimum field-of-view of a flight simulator visual system as a function of aircraft mission. The program is intended to provide the information needed to decide which portions of the aircraft's total field-of-view should be simulated and which can be disregarded. The approach consists of three phases; drawing board evaluation, aircraft ground testing, and flight testing. The procedure is described using the CH-46 helicopter as an illustrative example but it is applicable directly to any aircraft, fixed or rotary wing. Pilot qualitative ratings are obtained for each simulated visual configuration during specified flight maneuvers. GRA

N79-13064*# Naval Research Lab., Washington, D. C.
COMPARATIVE NOZZLE STUDY FOR APPLYING AQUEOUS FILM FORMING FOAM ON LARGE-SCALE FIRES Final Report, Nov. 1976 - Sep. 1977
Edwin J. Jablonski Tyndall AFB, Fla. Civil and Environ. Eng. Develop. Office Apr. 1978 45 p refs
(AFCEC Proj. 77-018)
(AD-A058562; NRL-6180-157-EJJ-NJS; CEEDO-TR-78-22)
Avail: NTIS HC A03/MF A01 CSCL 13/12

A large-scale fire test program was conducted to evaluate the relative fire-fighting effectiveness of applying aqueous film forming foams (AFFF) through commercially available air-aspirating and non air-aspirating nozzles. The Navy MB-1 and P-4A and Air Force P-4 aircraft fire-rescue vehicles were used as nozzle test-beds. Nozzles with rated capacities of 250 gpm and 750 to 800 gpm were tested and evaluated on 4000 square feet and 8000 square feet JP-4 fuel fires, respectively. Eight of the 16 fires conducted contained an aircraft mock-up. The lower expansion, more fluid, longer reach aqueous film forming foams generated with the non air-aspirating type nozzles were found to provide superior fire extinguishing effectiveness compared to the air-aspirating type nozzles. Air-aspirated foams required approximately 50 percent longer to achieve 90 percent fire control than the non air-aspirated foams. No discernible difference in burnback resistance was found for either type of foam.
Author (GRA)

N79-13065# Naval Air Development Center, Warminster, Pa. Systems Directorate.
INVESTIGATION OF MOTION BASE DRIVE TECHNIQUES
M. E. Bitner 3 Mar. 1978 153 p refs
(AD-A053830; NADC-77306-20) Avail: NTIS HC A08/MF A01 CSCL 05/9

Motion base drive functions required for simulating helicopter and V/STOL aircraft were investigated, developed and evaluated on the NAVAIRDEVCEN three degree of freedom motion base.
Author (GRA)

N79-13066# Air Force Human Resources Lab., Brooks AFB, Tex.
CONTRIBUTIONS OF PLATFORM MOTION TO SIMULATOR TRAINING EFFECTIVENESS. STUDY 1: BASIC CONTACT Interim Report, Mar. 1976 - Nov. 1977
Elizabeth L. Martin and Wayne L. Waag Jun. 1978 39 p refs
(AF Proj. 1123)
(AD-A058416; AFHRL-TR-78-15) Avail: NTIS HC A03/MF A01 CSCL 05/9

A transfer-of-training design was used to evaluate the contributions of simulator training with a synergistic six-degree-of-freedom platform motion system to the acquisition of basic contact, approach and landing skills. Twenty-four Undergraduate Pilot Trainees were divided into three groups: (1) Motion, (2) No Motion, and (3) Control. The Motion and No-Motion groups received ten instructional sorties in the Advanced Simulator for Pilot Training (ASPT) on a large number of basic contact tasks ranging in complexity from Straight-and-Level to the normal Overhead Pattern and Traffic Pattern Stalls. Both groups received the same amount of training on each task. All tasks were taught using the full field-of-view available on the ASPT's computer-generated image visual system. The students in the Control group received the standard pre-flight training (i.e., no ASPT pretraining). Student performance during the simulator training phase was assessed by Instructor Pilot ratings of task performance and automated objective performance measures. The major findings of the study are: (1) no differences in simulator performance between the Motion and No-Motion groups; (2) significant learning occurred during simulator training for both groups; (3) no difference in performance between the Motion and No-Motion groups for any of the tasks on the two special data sorties flown in the T-37. GRA

N79-13067# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
NONDESTRUCTIVE EVALUATION PROCEDURE FOR MILITARY AIRFIELDS Final Report, 1 Jul. - 30 Sep. 1976
Jim W. Hall, Jr. Jul. 1978 87 p refs
(AD-A058736; WES-MP-S-78-7) Avail: NTIS HC A05/MF A01 CSCL 01/5

This report presents a procedure for the nondestructive evaluation of military airfield pavements. Nondestructive testing is performed with a 16 kip electrohydraulic vibrator, which measures the load-deflection response of pavements, and the results are reported as dynamic stiffness modulus (DSM). Correlations of the DSM to allowable single-wheel load are used with existing analytical relationships to give the allowable gross aircraft loads and required overlay thicknesses. The procedures described are based on findings from earlier research studies that are referenced. Testing techniques, data reduction procedures, computational methodology, and detailed examples were developed to satisfy the need for a rapid nondestructive test procedure. Author (GRA)

N79-13068# Sandia Labs., Livermore, Calif.
FLIGHT DYNAMICS LABORATORY AT SLL
R. G. Marmon May 1978 58 p refs
(Contract EY-76-C-04-0789)
(SAND-78-8240) Avail: NTIS HC A04/MF A01

Missile flight mechanics are in multi-degree-of-freedom motion (simulated in real time) on the hybrid equipment. Guidance and control hardware can be mounted on the Carco device and subjected to the angular rates and displacements encountered in full-scale flight. In addition to flight simulation, the hybrid computer can be used effectively for solution of a variety of engineering and scientific problems involving ordinary differential equations and, in some cases, partial differential equations. A general description of the FDL is given, some software that is available is described and some past uses are summarized. DOE

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N79-13068*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCEEDINGS OF THE WORKSHOP ON AN ELECTROMAGNETIC POSITIONING SYSTEM IN SPACE
W. A. Oran, ed. Oct. 1978 25 p refs Workshop held at Washington, D. C., 1-2 May 1978
(NASA-CP-2069) Avail: NTIS HC A02/MF A01 CSCL 22A

A workshop was convened to help determine if sufficient justification existed to proceed with the design of an electromagnetic (EM) positioning device for use in space. Those in attendance included experts in crystal growth, nucleation phenomena, containerless processing techniques, properties of materials, metallurgical techniques, and glass technology. Specific areas mentioned included the study of metallic glasses and investigations of the properties of high temperature materials. B.B.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N79-13070*# Martin Marietta Corp., Denver, Colo. Denver Div.
EXPERIMENTAL INVESTIGATION OF LAUNCH VEHICLE TRANSIENT INPUT SIMULATION IN PAYLOAD TESTS
Paul Rader and Robert Berry Jan. 1979 22 p
(Contract NAS1-14370)
(NASA-CR-145349; MCR-78-555) Avail: NTIS HC A02/MF A01 CSCL 22B

The technique of electronically simulating the structural dynamics of a launch vehicle in transient tests of payloads using multiple vibration excitation systems was investigated. The development of computer programs to determine transfer functions, synthesize shaker forcing functions, and control vibration exciters is described. A demonstration test using the techniques was described and results are presented. The evaluation of the potential for applying this technique to large Shuttle payloads is discussed. Author

N79-13071# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE PASSIVE, GROUND-BASED, ELECTRO-OPTICAL DETECTION OF SYNCHRONOUS SATELLITES
Robert Weber 19 Jun. 1978 53 p refs
(Contract F19628-78-C-0002; AF Proj. 2128)
(AD-A059275; TN-1978-27; ESD-TR-78-213) Avail: NTIS HC A04/MF A01 CSCL 17/8

M.I.T. Lincoln Laboratory is engaged in supporting the Electronic Systems Division (ESD) of the Air Force Systems Command (AFSC) in developing the Ground-based Electro-Optical Deep Space Surveillance (GEODSS) system. As a part of this program an Experimental Test Site (ETS) has been established in the White Sands Missile Range, New Mexico, to serve as a test-bed for the system. After a brief description of the GEODSS network, the ETS and its role are defined and illustrated. Next, the matter of sensor selection for the ETS is discussed. This is followed by the consideration of the problem of point-source detection. A semi-empirical model which indicates the point-source detection capabilities of the background-limited ETS electro-optical sensors is presented. Short discussions of the satellite population and the problems associated with the passive detection of space objects by reflected sunlight are followed by conclusions based upon brightness measurements made at the ETS during approximately two years of operation. Author (GRA)

N79-13072# Human Engineering Labs., Aberdeen Proving Ground, Md.
PREDICTION OF TARGET TRAVEL DURING MISSILE TIME OF FLIGHT: A COMPUTER SIMULATION Final Report
Nils Haglund and James P. Torre, Jr. Jun. 1978 56 p refs
(AD-A059032; HEL-TM-17-78) Avail: NTIS HC A04/MF A01 CSCL 19/5

An experiment was conducted to measure an antitank guided missile (ATGM) gunner's ability to predict future target position. In two computer test programs, a moving tank and background were simulated on a CRT display. In the first program, subjects attempted to fire so that the ATGM would impact the target just as it reached a specified position on the display. Target distance, target speed, and time available to estimate target speed were varied. In the second program, the subject had to decide if a gap between two covered areas was wide enough for a missile to be fired successfully. Functional relationships between gunner: ability to predict target position, and target distance, speed, and time available were determined for the first part of the experiment. Functional relationships between gunners: ability to make correct decisions, and target distance, speed and gap size were determined for the second part of the experiment. It was concluded that the gunner's ability to predict target future travel and decide whether or not to fire is limited, but increases with practice. Although both experiments measured subject's ability to predict future target travel, results from the first computer simulation cannot be used to predict performance in the other computer simulation. This indicates that subjects used different strategies to predict future target travel when a very short time was available as opposed to when much longer time was available. GRA

N79-13073# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DUAL CONTROL ANALYSIS OF AN AIR TO GROUND MISSILE M.S. Thesis
James P. Kauppila Mar. 1978 128 p refs
(AD-A058515; AFIT/GA/EE/78-1) Avail: NTIS HC A07/MF A01 CSCL 16/4

Many errors are known to exist in Inertial Navigation Systems of modern air-to-ground missiles. These error sources, if undetected, contribute to navigation errors of position and velocity. This study analyzes one source of INS errors -- the misalignment of the accelerometer reference frame. By maneuvering a missile, the error source becomes more observable. Thus, a better estimate can be made of the error source. This directly influences the estimate of position. Hence, in order to minimize the terminal navigation error, some control energy must be expended to identify the error source. This dual control problem may be viewed as an optimization problem. By formulating a performance index of the terminal error and control energy appropriate mathematical techniques should yield an optimal flight trajectory. This thesis seeks to analyze the dual control nature of an air-to-ground missile. Two methods are used. The first uses a predetermined flight path which is incremented until a minimum is reached. The second is a first-order gradient which allows greater freedom in the control law. Author (GRA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N79-13074# ARO, Inc., Arnold Air Force Station, Tenn.
HEAT-TRANSFER TESTS ON THE NOSE OF THE SHUTTLE ORBITER EXTERNAL TANK (FH-15) Final Report
D. B. Carver and D. E. Boylan AEDC Jun. 1978 44 p refs
(AD-A058693; AEDC-TSR-78-V11) Avail: NTIS HC A03/MF A01 CSCL 20/13

Aerodynamic heating tests were conducted using a 0.0275 scale model of the space shuttle external tank nose to obtain detailed heat-transfer distributions. Special emphasis was placed on evaluating interference heating around the forward fairing, trays and gaseous oxygen line and brackets. The thin-skin thermocouple technique was used, and data were obtained at Mach numbers 3.4, and 5.5 at (free-stream Reynolds numbers of 3.7 and 5.0 million per ft. Model angle of attack was 0, and + or - 5 deg, with sideslip angles from +11 to -11 deg.
Author (GRA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N79-13075# Aerospace Corp., El Segundo, Calif. Engineering Group.
SYSTEM THEORY ASPECTS OF MULTI-BODY DYNAMICS Final Report
W. Jerkovsky 18 Aug. 1978 89 p refs
(Contract F04701-77-C-0078)
(AD-A058747; TR-0078(3901-03)-5; SAMSO-TR-78-77) Avail: NTIS HC A06/MF A01 CSCL 22/2

The spacecraft attitude dynamics and control problem is introduced as a broad class of nonlinear systems. Some of the basic properties of these systems are described from a system theory point of view. Various system theory concepts and research topics which have applicability to this class of systems are identified and briefly described. The subject of multi-body dynamics is presented in a vector space setting and is related to system theory concepts. Author (GRA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N79-13076# Army Missile Research and Development Command, Redstone Arsenal, Ala.
AN INVESTIGATION OF THE AERODYNAMIC STABILIZING EFFECTIVENESS OF SEVERAL SPLIT FLARE AFTERBODY CONFIGURATIONS IN THE PRESENCE OF AN UNDEREXPANDED JET PLUME AT TRANSONIC MACH NUMBERS
James R. Burt 9 Jan. 1978 87 p ref
(Contract DAAK40-77-C-0008)
(AD-A052812; TR-T-78-31; RTR-026-2) Avail: NTIS HC A05/MF A01 CSCL 16/4

A study of the stabilizing effectiveness of several folding, split flare afterbodies in the presence of an underexpanded jet plume is presented. Mach number was varied from 0.7 to 1.4 and angle of attack from -4 deg to 6 deg. It is shown that the split flare afterbody can be an effective stabilizing device for tube launched missiles. Author

N79-13077*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A SYSTEM FOR CONCURRENTLY DELIVERING A STREAM OF POWDERED FUEL AND A STREAM OF POWDERED OXIDIZER TO A COMBUSTION CHAMBER FOR A REACTION MOTOR Patent Application
Leon M. Delionback and Richard M. Stein, inventors (to NASA) Filed 5 Dec. 1978 15 p
(NASA-Case-MFS-23904-1; US-Patent-Appl-Sn-966549) Avail: NTIS HC A02/MF A01 CSCL 21H

A propellant delivery subsystem adapted to concurrently supply streams of powdered fuel and fluidized oxidizer includes one reservoir for powdered fuel and a second for powdered oxidizer. The particle size for the powdered fuel and powdered oxidizer is such that 99% will pass through a 100-235 mesh screen based on the Tyler 200 mesh screen system. Two flow control valves are provided in conduits connected to the reservoirs for metering streams of fuel and oxidizer flowing from the reservoirs to the combustion chamber. Injection of the powdered fuel and oxidizer is facilitated by a gas reservoir connected with the conduits for purposes of injecting the streams of fuel and oxidizer under pressure to the combustion chamber. NASA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N79-13078*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.
ORGANIC SOLIDS PRODUCED BY ELECTRICAL DISCHARGES IN REDUCING ATMOSPHERES: MOLECULAR ANALYSIS
B. N. Khare, Carl Sagan, John E. Zumberge, Deborah Sklarew, and Bartholomew Nagy Sep. 1978 18 p refs Prepared in

cooperation with Arizona Univ., Tucson
(Grant NGR-33-010-101)
(NASA-CR-157989; CRSR-701) Avail: NTIS HC A02/MF A01 CSCL 07C

The complex brown polymer produced on passage of an electrical discharge through a mixture of methane, ammonia, and water, is analyzed by pyrolytic GC/MS. Pyrolyzates include a wide range of alkanes, alkenes, aromatic hydrocarbons, aliphatic and aromatic nitriles, pyrroles, and pyridine. Similar pyrolyzates are obtained from polypeptides and polynucleotides with hydrocarbon moieties. This polymer is remarkably stable up to 950 C; its degradation products are candidate constituents of planetary aerosols in the outer solar system and the grains and gas in the interstellar medium. Author

N79-13079# Stanford Univ., Calif. Center for Materials Research.
MATERIALS RESEARCH AT STANFORD UNIVERSITY Annual Report (Final), 1 Jul. 1977 - 30 Jun. 1978
Jul. 1978 411 p refs
(Grant NSF DMR-76-00726)
(AD-A059194; CMR-78-9; AR-17) Avail: NTIS HC A18/MF A01 CSCL 05/1

This Seventeenth Annual Report includes information briefly describing the total research activity related to the science of materials at Stanford University during the period July 1, 1977 through June 30, 1978. This report contains brief descriptions of the various individual research programs active during this period. The organization of such a large and varied compilation presents a serious problem. Many programs are cooperative and involve catholic interests, so that arrangement by subject area becomes cumbersome. Arrangement by principal investigator was therefore used. In addition to brief abstracts relating to the various research programs, including the five major Thrust group research programs supported by the NSF-MRL block grant, compilations are included of publications, doctoral dissertations, faculty and senior staff members, research associates, graduate students and degrees awarded. Finally, a name index has been added for convenience in locating references to the activities of specific individuals. GRA

N79-13080# National Technical Information Service, Springfield, Va.
STANDARD REFERENCE MATERIALS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1978
George W. Reimherr Oct. 1978 228 p Supersedes NTIS/PS-77/0990; NTIS/PS-76/0802; NTIS/PS-75/667
(NTIS/PS-78/1096/3; NTIS/PS-77/0990; NTIS/PS-76/0802; NTIS/PS-75/667) Avail: NTIS HC $28.00/MF $28.00 CSCL 14B

The cited reports present research concerning standard reference materials for science and industry. Fields covered include chemistry, physics, pollution detection, and metallurgy. Most of the references originated from the National Bureau of Standards (NBS); however, not all NBS research on reference materials and standard methods are covered. (This updated bibliography contains 221 abstracts, 22 of which are new entries to the previous edition.) GRA

24 COMPOSITE MATERIALS

Includes laminates.

N79-13081# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
COMPOSITE MATERIALS WORKBOOK Interim Report, 1 Sep. 1978 - 1 Mar. 1978
Stephen W. Tsai and H. Thomas Hahn Mar. 1978 374 p refs Supersedes AFML-TR-77-33
(AF Proj. 2419)
(AD-A058534; AFML-TR-78-33; AFML-TR-77-33) Avail: NTIS HC A16/MF A01 CSCL 11/4

This workbook is intended to present to the users of composite materials a set of tools to solve most commonly encountered problems in design and testing. Attempts are made to simplify both the operational and conceptual aspects. Subjects are selected from the standpoint of practical application rather than elegance. This workbook is unique in that it requires the student to work through many numerical problems immediately after the presentation of formulas. Programmable pocket calculators, preferably with magnetic card capability, are most suitable to perform the necessary calculations. In a separate volume, a number of the formulas in this workbook have been preprogrammed. The description, operating instruction, and program listing for these formulas have been compiled for Texas Instruments SR-52. GRA

N79-13082# Syracuse Univ., N. Y. Dept. of Electrical Engineering.
A FUNDAMENTAL STUDY OF THE ELECTROMAGNETIC PROPERTIES OF ADVANCED COMPOSITE MATERIALS Progress Report, 1 Oct. 1976 - 30 Sep. 1977
W. J. Gajda Jul. 1978 51 p refs
(Contract F30602-75-C-0121)
(AD-A059029; RADC-TR-78-158) Avail: NTIS HC A04/MF A01 CSCL 11/4

This report covers an effort to understand, model and modify the fundamental electrical properties of advanced composite materials, specifically graphite/epoxy and boron/epoxy. The electrical properties of graphite and boron fibers and of epoxy were measured. The anisotropic conductivity of boron fibers was studied. Models were developed which predicted the electrical properties of the composites--with reasonable accuracy for some cases. GRA

N79-13083# Honeywell, Inc., Minneapolis, Minn. Avionics Div.
COMPOSITE GIMBAL MATERIALS STUDY Final Report, Jan. - Oct. 1977
L. V. Grandchamp, R. P. Grosso, and T. O. Rue May 1978 76 p
(Contract DAAG46-77-C-0011; DA Proj. 1L1-63102-D-071)
(AD-A059089; AMMRC-TR-78-25) Avail: NTIS HC A05/MF A01 CSCL 11/4

This report describes a study of composite materials for fabrication of structural elements in airborne gimballed optical systems. The particular system studied was the Pointing and Stabilization Element (POISE) gimballed platform as used for fire control and surveillance applications, and carried on remotely piloted vehicles (RPV). It was determined that the magnesium castings used for the two gimbals as well as the mounting base plate could be replaced with graphite-epoxy moldings, using a sandwich structure approach, with a foam core or an aluminum honeycomb core. Specific stiffness was found to be 3-5 times higher than magnesium, even when using sandwich structure. This results in a structural element of the same shape and size as the magnesium but which will be significantly lighter, while still being significantly stiffer, and projected to be less expensive. A fabrication process was conceived and proved out permitting molding of complex precision shapes, utilizing simple and low cost tooling. Author (GRA)

N79-13084# HH Aerospace Design Co., Elmsford, N. Y.
DYNAMIC FRACTURE IN ORTHOTROPIC FIBER COMPOSITES Annual Report (Final), Apr. 1977 - Apr. 1978
James H. Williams, Jr., Petros N. Kousiounelos, and Samson S. Lee May 1978 110 p refs
(Contract N00019-77-C-0294)
(AD-A058479; AR-1) Avail: NTIS HC A06/MF A01 CSCL 11/4

The underlying principles of dynamic fracture and crack arrest in fiber composites are reviewed in terms of the conservation of mechanical energy. An approximate Mode 1 dynamic crack extension force for a highly orthotropic 0 degree unidirectional fiber composite is derived. The governing partial differential equations for dynamic crack propagation in double cantilever beam unidirectional composite specimens are derived. A finite-difference scheme for solving these equations is presented along with the stability and convergence criteria for a numerical solution. A conductive grid system for measuring the crack-tip velocity profile is described. This system is capable of assisting in the measurement of the dynamic fracture toughness of fiber composites. Author (GRA)

N79-13085# Dayton Univ. Research Inst., Ohio.
FINITE ELEMENT METHOD FOR THE FINITE-DISPLACEMENT ANALYSIS OF SANDWICH COMPOSITE PANELS Final Report, Jul. 1975 - Jul. 1976
Robert A. Brockman and Fred K. Bogner Wright-Patterson AFB, Ohio AFFDL Apr. 1978 85 p refs
(Contracts F33615-75-C-3009; F33615-77-C-3075; AF Proj. 1368; AF Proj. 2401)
(AD-A058491; AFFDL-TR-78-14) Avail: NTIS HC A05/MF A01 CSCL 13/13

A finite element method is presented for the large deflection analysis of flat, layered sandwich panels having arbitrarily-shaped boundaries. Fully compatible isoparametric elements based upon Hermite bicubic interpolation are formulated, and requirements for the satisfaction of both displacement and slope compatibility are discussed. As special cases, the analysis can be applied to thin laminated plates and multicore sandwich, as well as elastically-supported plates. Solutions for geometrically nonlinear behavior are obtained by either the conjugate gradient or variable metric method. Applications presented include rectangular, skewed, annular and circular geometries. The analysis is shown to maintain displacement and stress accuracy for elements having extremely large aspect ratios, or edges which degenerate to a single point. Author (GRA)

N79-13086# Vought Corp. Advanced Technology Center, Inc., Dallas, Tex.
FRACTURE AND FATIGUE OF DIFFUSION, ADHESIVE, AND ROLL BONDED ALUMINUM, TITANIUM, AND ULTRAHIGH CARBON STEEL LAMINATES Final Report, 16 May 1977 - 16 May 1978
R. M. Johnson Jun. 1978 97 p refs
(Contract N00019-77-C-0287)
(AD-A058553; ATC-B-92100/8CR-80) Avail: NTIS HC A05/MF A01 CSCL 11/6

The fracture characteristics of twelve different diffusion bonded Al/Al, Ti/Ti and Ultrahigh Carbon Steel/Iron and adhesively bonded Al/Epoxy laminates were evaluated. The effects of periodic overloads on the fatigue crack retardation behavior in a roll bonded Al/Al laminate were also investigated. Specific systems investigated included: diffusion bonded 7475 Al/1100 Al, 7475 Al/6061 Al, 7075 Al/1100 Al, 7075 Al/7072 Al, Ti-6Al-4V/Commercially Pure Ti, and Ultrahigh Carbon Steel/Interstitial Free Iron; adhesively bond 7475 Al/FM73M and 7075 Al/FM73M; and roll bonded 7475 Al/1100 Al. It was found that all laminates with Al primaries exhibited substantially higher critical fracture toughness in the crack divider orientation than the corresponding baseline monolithic plate alloys. GRA

N79-13087# Kansas State Univ., Manhattan.
ELECTROMAGNETIC SHIELDING BY ADVANCED COMPOSITE MATERIALS Final Report
K. F. Casey Jan. 1978 153 p refs
(Grant AF-AFOSR-2980-76; AF Proj. 1209)
(AD-A058808; AD-E200137; AFWL-TR-77-201) Avail: NTIS HC A08/MF A01 CSCL 18/6

The transmission of electromagnetic waves through planar sheets and cylindrical shells of advanced composite laminates is considered in both the frequency and time domains. Attention is concentrated on the frequency range characteristic of the nuclear electromagnetic pulse. The composite laminates are modeled for the purposes of this study by isotropic dielectric or conducting materials. A new 'boundary connection operator' is developed to describe the connection between the tangential electric and magnetic fields on either side of a general multilayer shield. An equivalent sheet impedance operator is developed to describe the bonded wire-mesh screen which is often incorporated in boron-epoxy composite laminates to improve their shielding effectiveness. These analyses are used to study the transmission of EMP signals through planar composite sheets and into cylindrical composite shells in the frequency and time domains. Both graphite-epoxy and 'screened' boron-epoxy laminates are considered. Numerical results are presented to illustrate the analytical formulas which are derived. It is found that the shielding effect of a screened boron-epoxy composite laminate is essentially that of the screen itself. The laminate only has an effect on the equivalent sheet impedance of the screen for parallel-polarized fields, and this effect is relatively minor over the EMP frequency spectrum. GRA

N79-13088# Foreign Resources Associates, Fort Collins, Colo.
PROCESS FOR MANUFACTURING METAL-OXIDE PELLETS, AND PELLETS OBTAINED BY THIS PROCESS
Bernard Lelievre and Andre Feugier May 1978 8 p Transl. into ENGLISH of French Patent no. 2250187 Prepared for Atomics Intern. Div., Golden, Colo.
(RFP-Trans-242) Avail: NTIS HC A02/MF A01

A process for manufacturing nuclear fuels is described. It consists of a chemical process of adding to an aqueous solution of at least one metal salt, specifically of actinide nitrates, one or more chemical substances capable of liberating ammonia; of dispersing the solution thus obtained dropwise in a hot organic phase to gelify the drops and transform them into solid particles; and of washing, drying and treating these particles in order to transform them into oxide pellets. DOE

N79-13089# National Technical Information Service, Springfield, Va.
CARBON AND GRAPHITE. PART 1. CARBON AND GRAPHITE FIBERS AND FIBER COMPOSITES, VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Aug. 1976 - Aug. 1977
Mona F. Smith Oct. 1978 230 p
(NTIS/PS-78/1049/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

Reinforcements of numerous polymers and metals by carbon and graphite fibers are reported. Studies include processing, design, properties, stress analysis, and performance of the composite structures or parts. Composites from polyimide, epoxy, and aluminum matrices are among the types cited. Fabrication and testing of materials for rocket nozzles, reentry vehicles, aircraft components, automobiles, and ships are included. (This updated bibliography contains 224 abstracts). GRA

N79-13090# National Technical Information Service, Springfield, Va.
CARBON, AND GRAPHITE. PART 1: CARBON AND GRAPHITE FIBERS AND FIBER COMPOSITES, VOLUME 4. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Sep. 1977 - Sep. 1978
Mona F. Smith Oct. 1978 147 p Supersedes NITS/PS-77/0844; NTIS/PS-76/0685; NTIS/PS-75/613; COM-74-11527-Pt-1 (NTIS/PS-78/1050/0; NTIS/PS-77/0844; NTIS/PS-76/0685; NTIS/PS-75/613; COM-74-11527-Pt-1) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

This updated bibliography contains 141 abstracts, all of which are new entries to the previous edition. GRA

N79-13091# National Technical Information Service, Springfield, Va.
CARBON AND GRAPHITE. PART 2: CARBON AND GRAPHITE COMPOSITES (EXCLUDING CARBON FIBER COMPOSITES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1978
Mona F. Smith Oct. 1978 220 p Supersedes NTIS/PS-77/0845; NTIS/PS-76/0686; NTIS/PS-75/614; COM-74-11527-Pt-2 (NTIS/PS-78/1051/8; NTIS/PS-77/0845; NTIS/PS-76/0686; NTIS/PS-75/614; COM-74-11527-Pt-2) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

Citations on carbon or graphite composites which are not specifically concerned with carbon or graphite fibers are reported. This includes studies on non-fiber carbon reinforcement, carbon or graphite matrix composites, applications, properties, fabrication, and structural analysis. The majority of research concerns aircraft components and ablative materials for rockets. (This updated bibliography contains 214 abstracts, 17 of which are new entries to the previous edition.) GRA

N79-13092# National Technical Information Service, Springfield, Va.
CARBON AND GRAPHITE. PART 3: GRAPHITE, PHYSICAL, MECHANICAL AND STRUCTURAL STUDIES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Aug. 1978
Mona F. Smith Oct. 1978 300 p Supersedes NTIS/PS-77/

0846; NTIS/PS-76/0687; NTIS/PS-75/615; NTIS/PS-75/181 (NTIS/PS-78/1052/6; NTIS/PS-77/0846; NTIS/PS-76/0687; NTIS/PS-75/615; NTIS/PS-75/181) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

The physical, mechanical, and structural properties of graphite are presented. Studies of graphite composites and fibers are excluded along with graphite chemistry. The majority of these studies deals with the use of graphite as a reactor material. (This updated bibliography contains 294 abstracts, 30 of which are new entries to the previous edition.) GRA

N79-13083# National Technical Information Service, Springfield, Va.
CARBON AND GRAPHITE. PART 4: GRAPHITE, CHEMICAL PROPERTIES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1978
Mona F. Smith Oct. 1978 233 p Supersedes NTIS/PS-77/0847; NTIS/PS-76/0688; NITS/PS-75/616 (NTIS/PS-78/1053/4; NTIS/PS-77/0847; NTIS/PS-76/0688; NTIS/PS-75/616) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

The chemistry of graphite is reported. Studies are included on vaporization, thermodynamics, surface chemistry, intercalation compounds, chemisorption, and oxidation. (This updated bibliography contains 227 abstracts, 27 of which are new entries to the previous edition.) GRA

N79-13084# National Technical Information Service, Springfield, Va.
CARBON AND GRAPHITE. PART 5: CARBON RESEARCH. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Aug. 1978
Mona F. Smith Oct. 1978 169 p Supersedes NTIS/PS-77/0848; NTIS/PS-76/0689; NTIS/PS-75/617; NTIS/PS-75/182 (NTIS/PS-78/1054/2; NTIS/PS-77/0848; NTIS/PS-76/0689; NTIS/PS-75/617; NTIS/PS-75/182) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

The use, physical and mechanical properties, production and chemistry of various forms of carbon, such as carbon black, carbon foams, chars, coke, and activated carbon are considered. (This updated bibliography contains 163 abstracts, 27 of which are new entries to the previous edition.) GRA

N79-13085# National Technical Information Service, Springfield, Va.
CARBON AND GRAPHITE. PART 6: GLOSSY CARBON. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Aug. 1978
Mona F. Smith Oct. 1978 66 p Supersedes NTIS/PS-77/0849; NTIS/PS-76/0690; NTIS/PS-75/618; NTIS/PS-75/183 (NTIS/PS-78/1055/9; NTIS/PS-77/0849; NTIS/PS-76/0690; NTIS/PS-75/618; NTIS/PS-75/183) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

The research reports describe glassy carbon preparation, structure, properties, composites, and alloys with metals. (This updated bibliography contains 60 abstracts, 4 of which are new entries to the previous edition.) GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N79-13086 Iowa Univ., Iowa City.
A STOCHASTIC TREATMENT OF COLLISIONAL ENERGY TRANSFER IN GAS PHASE UNIMOLECULAR REACTIONS Ph.D. Thesis
Robert Joseph Malins 1978 217 p
Avail: Univ. Microfilms Order No. 7822425

The first order stochastic master equation is used to analyze a variety of collisional effects manifest in the study of gas phase unimolecular reactions. From the first order master equation, an analytical expression for the thermal rate constant under general collider conditions was derived; a computational algorithm based on the derivation is presented with sample results. The equation resulting from this derivation was used to identify the natural experimental parameter for characterizing weak collider effects. The thermal equation was extended to obtain a first approximation for the treatment of non-steady state systems. Both thermal and non-steady state formulae are evaluated by comparison to integrated master equation data for a model molecular system. Dissert. Abstr.

N79-13087 California Univ., Santa Barbara.
SURFACE AND GAS PHASE DEACTIVATION OF VIBRATIONALLY EXCITED CARBON MONOXIDE Ph.D. Thesis
Robert Henry Frisbee 1978 269 p
Avail: Univ. Microfilms Order No. 7822743

An experimental technique was explored for measurement of the surface deactivation of carbon monoxide in the v=1 vibration level. Finally, the rate constant for gas phase vibrational deactivation of CO (v=1) was measured for several aromatic collision partners. The theoretical model for surface deactivation treated the rate determining step in surface deactivation as vibration-to-vibration (V-V) energy transfer between an excited gas phase molecule and a physisorbed molecule of the same species on the surface. Since the vibrational frequencies of physisorbed molecules were lowered by only 10 to 20 cm to the -1 power (compared to their gas phase counterparts), this become a near resonant process. Furthermore, since the physisorbed molecule was only weakly perturbed, V-V transfer between the gas and physisorbed molecule had many of the same features as a purely gas phase V-V transfer. Dissert. Abstr.

N79-13088 North Carolina State Univ. at Raleigh
DERIVATIVE NORMAL PULSE POLAROGRAPHY Ph.D. Thesis
Otis Marion Evans 1978 349 p
Avail: Univ. Microfilms Order No. 7820026

The analytical potential of derivative normal pulse polarography (DNPP) was evaluated and compared with other pulse polarographic techniques. Studies show that DNPP yields an optimum in degree of resolution between successive peaks because measurements are made at an effective modulation amplitude of one-millivolt. For n = 3 and a modulation amplitude of 100 mV for DPP the signal ratio of DNPP to DPP is approximately 3 to 1; for n = 2, it is 2 to 1; for n = 1, it is about 1.4 to 1. Micromolar complexometric titrations using DPP and DNPP to detect the equivalence point were evaluated for utilization in studying trace metal speciation in both fresh water and sea water. Titrations of ethylene dinitrilotetracetic acid in pH 5 acetate buffer with Cu(2) using DPP yielded consistently low results. Computer deconvolution of overlapping DNP polarograms was evaluated for theoretical and experimental systems. Dissert. Abstr.

N79-13089 Utah Univ., Salt Lake City.
IGNITION AND PYROLYSIS OF POLYMER FILMS Ph.D. Thesis
James Herbert Hedges 1978 201 p
Avail: Univ. Microfilms Order No. 7821669

The pyrolysis rates and ignition temperatures of films of 25 microns m thick Mylar, a medium density polyethylene, and 50 microns m thick Nylon 66 were determined in a special apparatus which simulates the surface exposure and sample heating rates to be expected under actual fire conditions. Sample pyrolysis occurred in air at a known, uniform temperature, and a direct measure of the ignition temperature was obtained. The rate of mass loss from samples was obtained at high, constant temperatures and these data were described in terms of global but physically feasible mechanisms. These global descriptions were used to predict mass-loss-temperature relationships for heating at constant rates of temperature rise, and the predictions were compared to experimental measurements. Pyrolysis data were used to interpret the ignition data and to show that piloted ignition occur as when a combustible mixture is generated in the gas boundary layer at the exposed surface of the sample. Dissert. Abstr.

N79-13100 Cincinnati Univ., Ohio.
THE EFFECT OF EXHAUST GAS RECIRCULATION AND TURBULENCE ON THE BURNING VELOCITY, QUENCHING DISTANCE, AND MINIMUM IGNITION ENERGY IN A PREMIXED METHANE-AIR COMBUSTION Ph.D. Thesis
Nahum Gat 1978 341 p
Avail: Univ. Microfilms Order No. 7821566

Quantitative relationships were obtained for the burning velocity as a function of turbulence for levels of EGR ranging from zero to thirty per cent. The single wall quenching distance was studied by a set of ionization gauges, located in close proximity of the cold quenching surface, and a surface temperature probe measuring the instantaneous heat flux to the wall during the flame/wall interaction. Both methods gave results of similar magnitude. The required ignition energy, a strong function of the mixture dilution, increased by a factor of one hundred as EGR level increased from zero to thirty per cent. Turbulence further augmented the required ignition energy. Hydrogen enrichment of the fuel increased the burning velocity in the diluted mixture, and slightly reduced the quench layer thickness. Dissert. Abstr.

N79-13101*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONTINUOUS-FLOW ELECTROPHORESIS: MEMBRANE-ASSOCIATED DEVIATIONS OF BUFFER pH AND CONDUCTIVITY
Adam J. K. Smolka and Janice K. McGuire (Athens State Coll., Ala.) Nov. 1978 23 p refs
(NASA-TM-78210) Avail: NTIS HC A02/MF A01 CSCL 07D

The deviations in buffer pH and conductivity which occur near the electrode membranes in continuous-flow electrophoresis were studied in the Beckman charged particle electrophoresis system and the Hanning FF-5 preparative electrophoresis instrument. The nature of the membranes separating the electrode compartments from the electrophoresis chamber, the electric field strength, and the flow rate of electrophoresis buffer were all found to influence the formation of the pH and conductivity gradients. Variations in electrode buffer flow rate and the time of electrophoresis were less important. The results obtained supported the hypothesis that a combination of Donnan membrane effects and the differing ionic mobilities in the electrophoresis buffer was responsible for the formation of the gradients. The significance of the results for the design and stable operation of continuous-flow electrophoresis apparatus was discussed. Author

N79-13102*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RATE CONSTANT FOR THE FRACTION OF ATOMIC CHLORINE WITH FORMALDEHYDE FROM 200 TO 500K
J. V. Michael, D. F. Nava, W. A. Payne, and L. J. Stief Nov. 1978 20 p refs Prepared in cooperation with Catholic Univ. of America
(Grant NsG-5173)
(NASA-TM-79675) Avail: NTIS HC A02/MF A01 CSCL 07D

A flash photolysis - resonance fluorescence technique was used to measure rate constant. The results were independent of substantial variations in H2CO, total pressure (Ar), and flash intensity (i.e., initial Cl). The rate constant was shown to be invariant with temperature, the best representation for this temperature range being K = (7.48 + or - 0.50) x 10 to the minus 11 power cu cm molecule-1 s-1 where the error is one standard deviation. The rate constant is theoretically discussed and the potential importance of the reaction in stratospheric chemistry is considered. G.G.

N79-13103# Vermont Univ., Burlington. Dept. of Chemistry.
SYNTHESIS AND PROPERTIES OF SEVERAL NEW MOLECULAR CONDUCTORS
David B. Brown and James T. Wrobleski 10 Sep. 1978 12 p refs
(Contract N00014-75-C-0756)
(AD-A058697; TR-10) Avail: NTIS HC A02/MF A01 CSCL 07/2

Several d superscript 8 metal complexes with columnar structures have been prepared using diaminoglyoxime, rubeanic acid, dithiooxalate, and dimethylglyoxime as ligands. These compounds are susceptible to partial oxidation using a variety of electron acceptors such as iodine and quinone. Upon oxidation, the electrical conductivities of these materials increase by as much as eleven orders of magnitude. The role of intermolecular association in the preparation of an excitonic superconductor is discussed. Author (GRA)

N79-13104# Washington Univ., Seattle. Dept. of Chemistry.
HIGH TEMPERATURE GAS ENERGY TRANSFER Annual Summary Report, 1 Mar. 1977 - 3 Jun. 1978
B. S. Rabinovitch 15 Aug. 1978 10 p refs
(Contract N00014-75-C-0690; NR Proj. 092-549)
(AD-A058748) Avail: NTIS HC A02/MF A01 CSCL 07/4

Work under this contract is summarized. Results on vibrational energy transfer and temperature dependence by the Diffusion Cloud method are described; also, results by a novel and simple Variable Encounter Method for the study of vibrational energy transfer between gas molecules and a wall at high temperatures and levels of activation in the transient region. Author (GRA)

N79-13105# American Univ., Washington, D. C. Dept. of Chemistry.
DEVELOPMENT OF FACTS PROCEDURES FOR COMBINED CHLORINE AND OZONE IN AQUEOUS SOLUTIONS Final Report, Jun. - Dec. 1977
Nina Matheny Roscher, John Liebermann, Jr., William J. Cooper, and Eugene P. Meier Mar. 1978 64 p refs
(Grant DAMD17-77-G-9436)
(AD-A059011) Avail: NTIS HC A04/MF A01 CSCL 07/2

Most colorimetric procedures for chlorine analysis in treated water and wastewater suffer from the fact that they are not specific for free available chlorine. However, the FACTS (Free Available Chlorine Test with Syringaldazine) procedure is specific for free available chlorine in the presence of the common interferences found in water. This study describes the research leading to the modification of FACTS to give a procedure for total available chlorine and combined available chlorine. The modified FACTS procedure obeys Beer's Law through the range of 0-10 mg/1 total available chlorine (as Cl2) with a lower limit of 0.2 mg/1 (as Cl2). Ozonation is being explored as an alternative method for disinfection. Therefore, the FACTS procedure has also been modified to determine residual ozone in aqueous solutions obeying Beer's Law through the range of 0-6 mg/1 ozone with a lower limit of 0.2 mg/1 ozone. Author (GRA)

N79-13106# SRI International Corp., Menlo Park, Calif.
ION PHOTOFRAGMENT SPECTROSCOPY: POTENTIAL SURFACES OF MOLECULAR IONS Annual Report, 16 May 1977 - 16 May 1978
J. T. Moseley and P. C. Cosby 15 Jul. 1978 11 p refs
(Contract F44620-76-C-0095; AF Proj. 2303)
(AD-A059270; SRI-MP-78-63; AFOSR-78-1301TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The research reported here, has as its goal the application of the newly developed technique of ion photofragment spectroscopy to obtain information about the potential surfaces, lifetimes, and dissociations of polyatomic molecular ions. Information obtained using these techniques is useful to the Air Force because it will increase the understanding of the ionosphere and the photochemical properties of the stratosphere and troposphere, it can be used in the development of high-energy lasers and alternative energy sources using ionized gases (e.g., magneto-hydrodynamics), and it has applications in the field of laser-induced chemistry. There is also a fundamental interest in developing a better understanding of polyatomic molecules and of the specific state-to-state reactions they undergo. GRA

N79-13107# Utah Univ., Salt Lake City. Dept. of Chemistry.
AN ESR STUDY OF TITANIUM (3) EXCHANGED ZEOLITE A
Steven M. Kuznicki, K. Larry DeVries, and Edward M. Eyring 1 Sep. 1978 10 p refs
(Contract N00014-75-C-0796)
(AD-A059132; TR-17) Avail: NTIS HC A02/MF A01 CSCL 07/1

A comparison of the chemical reactivity of Ti(III) cations in A type and Y type zeolite lattices has been performed by the

use of electron spin resonance. While the state of the Ti(III) cation is similar in the two types of lattices, the reactions of absorbed gases with the two titanium (III) exchanged zeolites are strikingly different. The formation of a Ti(IV)-O4- radical in zeolite A is suggested. Author (GRA)

N79-13108# Utah Univ., Salt Lake City. Dept. of Chemistry.
WATER SPLITTING BY TITANIUM EXCHANGED ZEOLITE A
Steven M. Kuznicki and Edward M. Eyring 1 Sep. 1978 9 p refs
(Contract N00014-75-C-0796)
(AD-A059131; TR-16) Avail: NTIS HC A02/MF A01 CSCL 07/1

Visually detectable and chromatographically and mass spectrally identified hydrogen gas evolves from titanium (III) exchanged zeolite A immersed in water and illuminated with visible light. Titanium(III) exchanged zeolite X and zeolite Y do not produce this reaction. A photochemically produced, oxygenated titanium free radical (detected by electron spin resonance) not previously described is the species in the zeolite that reduces protons to molecular hydrogen. The other product of this reduction step is a nonradical, oxygenated titanium species of probable empirical formula TiO4. Heating the spent oxygenated titanium containing zeolite A under vacuum at 375 C restores over fifty percent of the free radical. Unlike previously reported systems, heating does not restore the original aquotitanium(III) species in the zeolite. Thus a means other than heating must be found to achieve a closed photochemical cycle that harnesses visible solar energy in the production of molecular hydrogen. The titanium exchanged zeolite A does, however, lend itself to a thermolysis of water previously described by Kasai and Bishop.
Author (GRA)

N79-13109# Space Sciences, Inc., Monrovia, Calif.
HEATS OF FORMATION OF GASEOUS METALLIC HALIDES Interim Report, 1 May 1977 - 30 Apr. 1978
Milton Farber Jun. 1978 10 p refs
(Contract F44620-74-C-0075; AF Proj. 2308)
(AD-A059066; AFOSR-78-1127TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The heats of formation for the silane chlorides and fluorides SiHCl3(g), SiH2Cl2(g), SiH3Cl(g), SiHF3(g), SiH2F2(g) and SiH3F(g) were determined from high temperature thermochemical reactions of SiCl4(g) with H2, SiHCl3 with H2 and SiF4(g) with H2. Ion intensities for the species involved in the reactions were obtained mass spectrometrically, leading to equilibrium constants and reaction enthalpies. The heats of formation were obtained by both second and third law methods and found to be in good agreement. Author (GRA)

N79-13110# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Aeronautical and Astronautical Engineering.
SUMMARY OF WORK ON INITIATION, COMBUSTION AND TRANSITION TO DETONATION IN HOMOGENEOUS AND HETEROGENEOUS REACTIVE MIXTURES Interim Report, 1 Jun. 1977 - 31 May 1978
Roger A. Strehlow, Harold O. Barthel, and Herman Krier Jun. 1978 23 p refs
(Grant AF-AFOSR-3336-77)
(AD-A059047; AFOSR-78-1154TR) Avail: NTIS HC A02/MF A01 CSCL 19/1

The research deals with the broad topics of initiation, combustion and transition to detonation in homogeneous and heterogeneous reactive mixtures. One specific area deals with analytical and experimental work directed to direct initiation of detonation by a nonideal blast wave in chemically sensitized reactive fuel-air clouds. The other specific topic involves the hydrodynamic modelling of ignition and flamespreading in granular energetic solids to predict the potential for deflagration-to-detonation (DDT). GRA

N79-13111# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.
FLAMEHOLDER COMBUSTION INSTABILITY STUDY Final Report, 1 Mar. 1976 - 30 Sep. 1977
R. C. Ernst May 1978 167 p refs
(Contract F33615-76-C-2023; AF Proj. 3066)
(AD-A058794; PWA-FR-9163; AFAPL-TR-78-24) Avail: NTIS HC A08/MF A01 CSCL 19/1

A model has been developed which predicts the efficiency and low frequency response of a turbofan augmentor with conventional flameholders. The model evaluates the stability characteristics of the flameholders at low inlet temperature a with model for two-phase fuel flames. The driving potential for flow frequency instability is identified with excessive flameholder wake fuel-air ratio. The model is compared to engine experience, available literature and other models with favorable results. The relative stability characteristics of two forced mixing augmentor concepts were examined and the reduction in the dependence of overall efficiency on fuel-air ratio was found to be stabilizing. Recommendations for flameholder design procedures are presented. Author (GRA)

N79-13112# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
CARBON: THE 129-YEAR CONTROVERSY OVER THE SOLID-LIQUID-VAPOR TRIPLE POINT Interim Report
A. Greenville Whittaker 22 Aug. 1978 13 p refs
(Contract F04701-77-C-0078)
(AD-A058822; TR-0078(3950-03)-3; SAMSO-TR-78-121) Avail: NTIS HC A02/MF A01 CSCL 20/13

The location of the solid-liquid-vapor triple point on the carbon phase diagram has been a subject for controversy for many years. A triple-point pressure of approx. 100 atm. has been favored for quite some time, but recent data indicate that the correct value is approx. 1 atm. An effort is made to account for the high-pressure data on the basis of a recently proposed phase diagram. Author (GRA)

N79-13113# North Carolina Univ. at Chapel Hill. Dept. of Chemistry.
PHOTOCHEMISTRY OF ALKENES Final Report, 1 Apr. 1975 - 30 Jun. 1978
Paul J. Kropp Aug. 1978 16 p refs
(Grant DAAG29-75-G-0109)
(AD-A058523; ARO-12810.2-C) Avail: NTIS HC A02/MF A01 CSCL 07/4

Important insight into the number and electronic nature of the excited states of alkenes and the effect of structure on their relative energies has been gained which both confirms and extends earlier conclusions from theoretical and spectroscopic studies. The photochemistry of alkenes will be covered extensively in two review articles. The salient features are outlined in this report. Author (GRA)

N79-13114# Center for Naval Analyses, Arlington, Va.
DIFFUSION THEORY OF REACTION RATES. 1: FORMULATION AND EINSTEIN-SMOLUCHOWSKI APPROXIMATION
Marc Mangel Jan. 1978 57 p refs
(AD-A058541; CNA-PP-229) Avail: NTIS HC A04/MF A01 CSCL 20/13

The diffusion model of reaction rates is rederived and extended. The derivation is based on a clear physical picture of the molecular events. The origin of the stochastic forces is also clearly treated. Classical mechanics is used throughout. This paper, uses the Einstein-Smoluchowski approximation and, thus, considers, a diffusion model in position space only. The diffusion equations is non-dimensionalized and a number of singular perturbation problems are obtained. By using the diffusion model, one can treat a number of problems involving reaction rate theory. A new form of transition state theory is derived. Calculate reaction rate constants, transmission coefficients and the lifetime of the activated complex are calculated. GRA

N79-13115# Center for Naval Analyses, Arlington, Va.
DIFFUSION THEORY OF REACTION RATES. 2: ORNSTEIN-UHLENBECK APPROXIMATION
Marc Mangel Feb. 1978 40 p refs
(AD-A058542; CNA-PP-230) Avail: NTIS HC A03/MF A01 CSCL 20/13

The diffusion theory of reaction rates is considered in the Ornstein-Uhlenbeck approximation. The rate constant is calculated by using a modified Kramers (eigenvalue) method and by using the expected time formulation. The transmission coefficient is calculated. It is shown how correlation functions can be calculated. In the last section, a model problem is considered.Author (GRA)

N79-13116# Wisconsin Univ. - Madison.
ORDER-DISORDER TRANSFORMATIONS IN CHEMISORBED LAYERS: OXYGEN ON W(110)
W. Y. Ching, D. L. Huber, M. G. Lagally, and G. C. Wang 13 Jun. 1978 23 p refs
(Contract N00014-76-C-0727; NR Proj. 392-014)
(AD-A058623; TR-5) Avail: NTIS HC A02/MF A01 CSCL 07/4

Order-disorder transformation in oxygen adsorbed on W(110) was investigated. An analysis of the ordering at T=0 using the lattice gas formalism shows that there must be significant three-particle interactions to break the particle-hole symmetry. This is necessary since there is a p(2x2) phase at three-quarter coverage which is not present at one-quarter coverage. Monte Carlo techniques are used to obtain estimates of the strength of the two and three-particle interactions by matching calculated and measured LEED intensity curves. The qualitative characteristics of the phase diagram are discussed with emphasis on the multicritical points which must be present if the transition at half coverage is second order. Evidence in support of a second order transition is reviewed. Author (GRA)

N79-13117# Sandia Labs., Albuquerque, N. Mex.
SURFACE ANALYTICAL INVESTIGATIONS AT SANDIA LABS./ALBUQUERQUE
H. H. Madden 1978 23 p refs Presented at 8th Conf. on Surface Studies, Aiken, S. Carolina, 9 May 1978
(Contract EY-76-C-04-0789)
(SAND-78-0907C; Conf-780562-2) Avail: NTIS HC A02/MF A01

An overview is given of some projects which (1) have used surface analytical techniques in a conventional way to investigate specific surface-related problems; (2) have utilized surface studies to get a more fundamental understanding of the operations of various devices and components, and of the factors that determine such parameters as the lifetime and reliability of such devices; and (3) were undertaken to better understand just what additional information can be extracted from two of the myriad surface analytical techniques, Auger electron spectroscopy (AES) and electron-stimulated desorption (ESD). Ion microprobe analysis was applied to the study of contaminants on and in these films; and thermal desorption spectroscopy was used to identify, and to determine the binding energy of gases evolved during outgassing of materials used in tube construction. DOE

N79-13118# California Univ., Berkeley. Lawrence Berkeley Lab.
PHYSICAL AND CHEMICAL PROPERTIES OF COMBUSTION GENERATED SOOT
R. Toossi May 1978 165 p refs
(Contract W-7405-eng-48)
(LBL-7820) Avail: NTIS HC A08/MF A01

The physical and chemical properties of soot particles generated by an acetylene-air, premixed flame stabilized on a well-characterized, water cooled, porous, flat flame burner are analyzed over a wide range of operating parameters. To characterize the soot generated in combustion systems as a function of combustion parameters, the temperature, velocity, and burner heat losses are measured over the stable range of burner operation. The flat flame achieved with this burner is uniform in temperature over the entire flame disk within a few percent of the maximum flame temperature. In separate experiments, hot film indicates that the cold flow gas velocity assessment is uniform within approximately 10% over the entire porous disk. Particle size distribution measurements by an electrical aerosol size analyzer indicate two submicron modes, one centered at approximately 80 A and another which occurs only in luminous flames at high equivalence ratios at approximately 500 A. The chemical composition of soot collected on different filter media is determined by X-ray photoelectron spectroscopy (ESCA) and X-ray fluorescent techniques. DOE

N79-13119# Ames Lab., Iowa.
HIGH PURITY ELECTROCHEMICAL EXPERIMENTAL SYSTEM
M. F. Weber Feb. 1978 30 p refs
(Contract W-7405-eng-82)
(IS-4437) Avail: NTIS HC A03/MF A01

A closed system is described in which freshly purified water and gases may be directed into a sealed test cell for electrochemical studies which require conditions of ultra high purity. The apparatus consists of purification trains for He, H2, and O2 gases, an in-situ still for repeated distillation of large quantities of water, and a well-sealed test cell which maintains the high-purity conditions during extended electrochemical experiments. The apparatus features quartz and teflon construction throughout and the connecting gas lines are pyrex glass with glass and teflon valves. The cell is quite versatile in that up to five samples may be loaded at one time with only 120 ml solution in the test compartment. A variety of experiments may be performed with the cell, including fast voltage scans, capacitance measurements, photoelectrochemical studies, and steady state current-voltage, or Tafel measurements. DOE

N79-13120# National Technical Information Service, Springfield, Va.
ELECTROCHEMICAL REACTIONS AT SURFACES, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - 1978
Diane M. Cavagnaro Sep. 1978 173 p
(NTIS/PS-78/1033/6) Avail: NTIS HC $28.00/MF $28.00 CSCL 07D

Electrode processes in aqueous solutions are covered, although some molten salt processes are included. The research covers battery electrode reactions, catalyst reactions, electrochemical corrosion studies, theoretical analysis, fuel cell electrode reactions, electrical double layer, chemisorption, and measurement techniques. GRA

N79-13121# National Technical Information Service, Springfield, Va.
ELECTROCHEMICAL REACTIONS AT SURFACES, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1978 - Sep. 1978
Diane M. Cavagnaro Sep. 1978 107 p Supersedes NTIS/PS-77/0927; NTIS/PS-76/0815; NTIS/PS-75/644
(NTIS/PS-78/1034/4; NTIS/PS-77/0927) Avail: NTIS HC $28.00/MF $28.00 CSCL 07D

Volume 2 of this bibliography is presented. The bibliography contains abstracts covering electrode processes in aqueous solutions. See also Volume 1, N79-13120. G.Y.

N79-13122# National Technical Information Service, Springfield, Va.
FOURIER TRANSFORM INFRARED SPECTROSCOPY. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Oct. 1978
Diane M. Cavagnaro Oct. 1978 73 p Supersedes NTIS/PS-77/0975; NTIS/PS-76/0917
(NTIS/PS-78/1093/0; NTIS/PS-77/0975; NTIS/PS-76/0917) Avail: NTIS HC $28.00/MF $28.00 CSCL 07D

These abstracts of citations to Federally-funded research reports cover the theory, design, and applications of Fourier transform infrared spectroscopy. Although some of the reports discuss the spectra of specific compounds, most deal with spectrophotometer design and techniques. This updated bibliography contains 68 abstracts, 25 of which are new entries to the previous edition. GRA

N79-13123# National Technical Information Service, Springfield, Va.
FOURIER TRANSFORM INFRARED SPECTROSCOPY. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Oct. 1978
Diane M. Cavagnaro Oct. 1978 149 p Supersedes NTIS/PS-77/0976; NTIS/PS-76/0918
(NTIS/PS-78/1094/8; NTIS/PS-77/0976; NTIS/PS-76/0918) Avail: NTIS HC $28.00/MF $28.00 CSCL 07D

These citations of worldwide research cover Fourier transform infrared spectroscopy. Most of the abstracted reports are concerned with theory, techniques, and equipment design. However, spectra studies and the use of this method in reaction kinetics are also included. This updated bibliography contains 144 abstracts, 48 of which are new entries to the previous edition. GRA

N79-13124# National Bureau of Standards, Washington, D. C. Center for Fire Research.
BACK-UP REPORT FOR THE PROPOSED STANDARD FOR THE FLAMMABILITY (CIGARETTE IGNITION RESISTANCE) OF UPHOLSTERED FURNITURE, PFF 6-76 Final Report
Joseph J. Loftus Jun. 1978 232 p refs
(PB-285173/1; NBSIR-78-1438) Avail: NTIS HC A11/MF A01 CSCL 13L

Data, information, and reports are detailed that were generated by the Center for Fire Research (CFR) at the National Bureau of Standards (NBS) and by others during four years of work on the development of the test method. All of this information was used in the preparation of a recommended proposed standard for the flammability (cigarette ignition resistance) of upholstered furniture. GRA

N79-13125# Research Triangle Inst., Research Triangle Park, N. C.
PREPARATION OF COMPOSITE HOLLOW-FIBER REVERSE OSMOSIS MEMBRANES BY PLASMA POLYMERIZATION Final Report, 1 Jun. 1977 - 31 May 1978
N. Morosoff 3 Aug. 1978 119 p refs
(Contract DI-14-34-0001-7537)
(PB-285383/6; W78-10619) Avail: NTIS HC A06/MF A01 CSCL 07D

A tandem plasma polymerization apparatus for continuous coating of hollow fibers was built. The effects of changing plasma polymerization variables on the properties of the resultant plasma polymer were carried out using tetrafluoroethylene in this apparatus. The distribution of plasma power density was found to be non-uniform within the interelectrode gap in keeping with the known physics of glow discharges. The reverse osmosis properties of plasma polymer coated hollow fibers were described. Salt rejections of 87-93% were achieved at fluxes of 1.5-4.0 g.f.d. with fiber take up rate of 50-100 cm/min. All plasma polymerizations were studied at a frequency of 10 kHz using magnetic enhancement. GRA

N79-13126# Auerbach Associates, Inc., Philadelphia, Pa.
BENZIDINE DERIVED DYES AND/OR PIGMENTS Final Report
Wendy L. Byer, Arthur Katz, John Keresztesy, Roger T. Malseed, and Angela Mazella 2 May 1978 113 p refs
(Contract CPSC-C-77-0088)
(PB-284854/7; AAI-2434) Avail: NTIS HC A06/MF A01 CSCL 07D

The route of exposure of consumers to benzidine through association with benzidine derived dyes and the degree of risk posed by such exposure is investigated. Chemical information on ten of the most common dyes and economic data on U.S. and foreign production as well as forms of consumption. Environmental considerations and pertinent government regulations are discussed. A comprehension toxicological considers the findings regarding benzidine derived dyes and pigments and reviews the toxicity of benzidine itself. In absence of epidemiological studies on benzidine dyes and pigments indication of its human carcinogenic risk is extrapolated from animal studies and the demonstration of metabolism of certain of these dyes to benzidine. GRA

N79-13127# National Technical Information Service, Springfield, Va.
COMBUSTION OF PLASTICS AND ELASTOMERS, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - 1976
Diane M. Cavagnaro Oct. 1978 137 p
(NTIS/PS-78/1126/8) Avail: NTIS HC $28.00/MF $28.00 CSCL 11I

A bibliography containing 131 abstracts concerning the combustion products from plastics and elastomers as related to their chemistry, fire safety, toxic gases, and burning rate is presented. GRA

N79-13128# National Technical Information Service, Springfield, Va.
COMBUSTION OF PLASTICS AND ELASTOMERS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1977 - Oct. 1978
Diane M. Cavagnaro Oct. 1978 173 p Supersedes NTIS/PS-77/1003; NTIS/PS-76/0915; NTIS/PS-75/728; NTIS/PS-75/084 (NTIS/PS-78/1127/6; NTIS/PS-77/1003; NTIS/PS-76/0915; NTIS/PS-75/728; NTIS/PS-75/084) Avail: NTIS HC $28.00/MF $28.00 CSCL 11I

A bibliography containing 167 abstracts concerning combustion and combustion products of plastics and elastomers is presented. The citations cover combustion chemistry, fire safety, toxic gases, and burning rate. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N79-13129 Wisconsin Univ. - Madison.
OXIDATION REACTION AT METAL OXIDE ELECTRODES Ph.D. Thesis
Karl George Schick 1978 137 p
Avail: Univ. Microfilms Order No. 7823498

The first section of this thesis focuses on the integration of two major areas of organic and electrochemistry, namely those areas involved in the heterogeneous and electrocatalytic oxidation of organic compounds at lead, nickel, copper and silver oxide surfaces. The oxidation processes occurring at transition metal oxide surfaces are discussed primarily in terms of the oxidation of alcohols and amines. In the second part, research results are presented and discussed which involve three main areas of investigation: (1) elucidating the oxidative adsorption reactions of cysteine at lead dioxide electrodes; (2) an H2O2 selective amperometric electrode is described which is based upon the decomposition of H2O2 by a PbO2 catalyst; and (3) a nonenzymatic method for determining serum glucose is described. Dissert. Abstr.

N79-13130 Stanford Univ., Calif.
FLASH DESORPTION STUDY OF THE DECOMPOSITION OF CARBOXYLIC ACIDS ON CLEAN NICKEL (110), COPPER (110), AND NICKEL/COPPER (110) ALLOY SINGLE CRYSTALS: SURFACE COMPOSITIONAL EFFECT Ph.D. Thesis
David Hon Sing Ying 1978 299 p
Avail: Univ. Microfilms Order No. 7822594

The major interest of alloying in the field of catalysis is its effect on the selectivity and the activity for a catalytic reaction. In the interpretation of the catalytic properties of the alloy catalysts, the understanding of the reaction mechanism and the surface composition are very important. The catalytic decomposition of formic acid and acetic acid was investigated on a clean, (110) oriented nickel/copper alloy single crystal to illustrate the surface compositional effects of alloys. The reaction was studied on the pure metal components to elucidate the catalytic properties of the alloy. Flash desorption spectroscopy was employed to study the catalytic decomposition of the two carboxylic acids and, to some extent, the adsorption of carbon monoxide. The surface composition of the metals and the nickel/copper alloys were measured by means of Auger electron spectroscopy. Dissert. Abstr.

N79-13131 Iowa Univ., Iowa City.
EFFECTS OF TEMPERATURE, IRRADIATION AND COLD WORK ON CREEP BEHAVIOR METALS Ph.D. Thesis
Chi-pang Wei 1978 112 p
Avail: Univ. Microfilms Order No. 7822465

The creep behavior of metals was investigated using two main approaches: one is the linear kinetic constitutive equation in conjunction with the nonquadratic form of the Gibb's free energy; the other is the nonlinear kinetic constitutive equation in conjunction with the quadratic form of the Gibb's free energy. In general, the second approach has a more profound physical foundation but the first approach has the capability to describe the nonlinear of the stress-dependence of transient creep. In the derivation of a kinetic constitutive equation, the slope of the local tilt of potential energy barriers has been proposed in the form. Dissert. Abstr.

N79-13132 Stanford Univ., Calif.
CREEP OF NICKEL AT INTERMEDIATE TEMPERATURES Ph.D. Thesis
Jay Ross Spingarn 1978 259 p
Avail: Univ. Microfilms Order No. 7822578

Deformation of pure nickel in the 0.3 to 0.6 temperature range is controlled by dislocation core self diffusion. Kinetics for the climb of edge dislocations by lattice and core diffusion are determined for several climb mechanisms. Theories of creep which involve grain boundary diffusion are reviewed and a model is proposed for the interaction of a slip band with a grain boundary. A baseline of pure nickel data was determined and the grain structure of fine grained pure nickel was analyzed after static annealing and creep straining. The stability of nickel produced by physical vapor deposition and electro-deposition is discussed. Theories of dislocation core diffusion controlled creep, as presently formulated, are not in good agreement with measured rates for the creep of nickel. At high stresses, the theories make predictions which are about 100 times too low. Dissert. Abstr.

N79-13133 Washington Univ., Seattle.
RHOMBOHEDRAL TWINNING IN ALUMINUM OXIDE SINGLE CRYSTALS UNDER COMPRESSIVE STRESS Ph.D. Thesis
K. Keunho Orr 1978 110 p
Avail: Univ. Microfilms Order No. 7824490

Aluminum oxide single crystals were tested in compression in an Instron testing machine at various temperatures and strain rates, resulting in rhombohedral twins at temperatures as low as ambient. From the Instron stress - crosshead displacement charts, the variation of resolved shear stress for twinning (RSST) vs. temperature and strain rate was established and six different types of stress - strain modes were derived. From RSST vs. temperature and strain rate, thermal activation parameters for twin dislocations were determined by using Smidt's model. From the six different stress - strain modes, relative twin growth rates were determined. Twin widths were calculated based on the sharp stress drops which accompany the individual twin formation. Dissert. Abstr.

N79-13134 Georgia Inst. of Tech., Atlanta.
THE EFFECT OF INTERMEDIATE THERMOMECHANICAL TREATMENTS ON THE FATIGUE PROPERTIES OF TWO 7XXX ALUMINUM ALLOYS Ph.D. Thesis
Robert Edward Sanders, Jr. 1978 134 p
Avail: Univ. Microfilms Order No. 7824119

Intermediate thermomechanical treated materials of the two alloys were studied in both asrecrystallized (AR) and as-recrystallized plus hot-rolled (AR+HR) conditions. Microstructures of the AR variants were highly recrystallized with very fine equiaxed grains. AR+HR hot-rolled variants of the experimental alloys exhibited the test overall combination of fatigue properties of the materials studied. Total low cycle fatigue and high cycle fatigue lives of the experimental materials were relatively unaffected by changes in microstructure produced by ingot processing. However, quantitative metallography showed that the crack initiation resistance of AR variants was somewhat improved over that of the hot-rolled materials. The fatigue crack propagation data of the present investigation showed that the presence of residual stresses in unstretched plate materials could markedly affect crack growth rates. Dissert. Abstr.

N79-13135 Missouri Univ. -Rolla.
ANODIC DISSOLUTION OF ZINC AND LEAD SULFIDES Ph.D. Thesis
Ramagouda Appugouda Narasagoudar 1977 202 p
Avail: Univ. Microfilms Order No. 78-22372

ZnS studies were made primarily in H_2SO_4 although a limited number of tests were also conducted in HCl and KOH. Polarization studies showed that both ZN(-2) and S were products in the acidic solutons. ZnS passivated in KOH solutions. Current efficiencies and ZN(+2) S ratios were determined at 0.5 and 0.85 V SHE. The results indicated the occurrence of both electrochemical and chemical dissolution steps as well as the further oxidation of H_2S. The overall dissolution appears to be mass transfer-limited. PbS studies were made in HAc, HNO_3, and HClO. THe anodes were fabricated by melting and casting the PbS or by hand pressing PbS concentrate with and without pitch binder and then sintering. The dissolution proceeded according to the reaction. The rate was highest in $HClO_4$, intermediate in HNO_3, and lowest in HAc. Dissert. Abstr.

N79-13136 Missouri Univ. -Rolla.
THE EFFECTS OF CERTAIN IMPURITIES AND THEIR INTERACTIONS ON ZINC ELECTROWINNING Ph.D. Thesis
Donald Ralph Fosnacht 1978 250 p
Avail: Univ. Microfilms Order No. 7822369

The effects of germanium, antimony, arsenic, cobalt, glue, and free acid concentration were studied on both commercial and synthetic electrolytes. It was found that the acid concentration was the most critical factor when inpurity levels were at normal plant solution concentrations. The ranges where the effect of the impurity became apparent were: greater than 20 ppb for antimony; 40 ppb for germanium, 120 ppb for arsenic; and 7-8 mg/1 for cobalt for a solution containing 65 g/1 zinc and 100 g/1 for free sulfuric acid. At higher levels of acid, the acceptable level of impurity declined markedly. Glue additions were found to counteract the effects of antimony and germanium, but did little to counteract the effects of cobalt and arsenic. Cobalt and arsenic exhibited synergism and lower current efficiences were obtained for arsenic-cobalt combinations than expected. Dissert. Abstr.

N79-13137*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GEOMETRIC RELATIONSHIPS FOR HOMOGENIZATION IN SINGLE-PHASE BINARY ALLOY SYSTEMS
Jalaiah Unnam (George Washington Univ.), Darrel R. Tenney, and Bland A. Stein Nov. 1978 15 p refs
(NASA-TP-1349; L-12588) Avail: NTIS HC A02/MF A01 CSCL 11F

A semiempirical relationship is presented which describes the extent of interaction between constituents in single-phase binary alloy systems having planar, cylindrical, or spherical interfaces. This relationship makes possible a quick estimate of the extent of interaction without lengthy numerical calculations. It includes two parameters which are functions of mean concentration and interface geometry. Experimental data for the copper-nickel system are included to demonstrate the usefulness of this relationship. Author

N79-13138*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF CONCENTRATION DEPENDENCE OF THE DIFFUSION COEFFICIENT ON HOMOGENIZATION KINETICS IN MULTIPHASE BINARY ALLOY SYSTEMS
Darrel R. Tenney and Jalaiah Unnam (George Washington Univ.) Nov. 1978 39 p refs
(NASA-TP-1281; L-12224) Avail: NTIS HC A03/MF A01 CSCL 11F

Diffusion calculations were performed to establish the conditions under which concentration dependence of the diffusion coefficient was important in single, two, and three phase binary alloy systems. Finite-difference solutions were obtained for each type of system using diffusion coefficient variations typical of those observed in real alloy systems. Solutions were also obtained using average diffusion coefficients determined by taking a logarithmic average of each diffusion coefficient variation considered. The constant diffusion coefficient solutions were used as reference in assessing diffusion coefficient variation effects. Calculations were performed for planar, cylindrical, and spherical geometries in order to compare the effect of diffusion coefficient variations with the effect of interface geometries. In most of the cases considered, the diffusion coefficient of the major-alloy phase was the key parameter that controlled the kinetics of interdiffusion. Author

N79-13139# Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
RAMAN AND INFRARED SPECTROSCOPY OF AQUEOUS CORROSION FILMS ON LEAD
Robert H. Heidersbach, Chris W. Brown, Richard J. Thibeau, and Arnon Z. Goldfarb Aug. 1978 73 p refs
(Contract N00014-76-C-0889)
(AD-A058614; TR-4) Avail: NTIS HC A04/MF A01 CSCL 11/6

The use of Raman and infrared spectroscopy to analyze surface films on metals is described. Surface films formed on lead by reaction with aqueous buffer solutions were examined. The composition of each film was determined by Raman spectroscopy while the sample was in the solution. Multiple reflection infrared spectra of dry samples confirmed the Raman results. The Pourbaix diagrams for lead in water with and without chloride were calculated and potentiostatic exposures were conducted to see if the compounds correspond to those predicted in the diagram. Tetragonal PbO was found to occur over a much greater range of potentials than thermodynamic stability would indicate. Several differences due to the presence of chlorides were noted. Author (GRA)

N79-13140# State Univ. of New York, Stony Brook.
FEASIBILITY STUDY ON THE USE OF SMALL-ANGLE NEUTRON SCATTERING FOR MICROSTRUCTURAL DETERMINATIONS OF TECHNOLOGICAL ALLOYS, CARRIED OUT AT ATOMIC WEAPONS RESEARCH ESTABLISHMENT (AWRE), ALDERMASTON, ENGLAND Progress Report
Herbert Herman 1978 6 p
(Contract N00014-78-M-0074)
(AD-A058472) Avail: NTIS HC A02/MF A01 CSCL 11/6

This preliminary research program on non-destructive evaluation using small-angle neutron scattering (SANS), was initiated and supported by the Naval Air Systems Command and the Office of Naval Research. The central goal of this aspect of the effort was to show feasibility of SANS through studies of technological alloys in conjunction and at AWRE. The details of SANS and the AWRE facility were described. Since that time, a LETI area detector was installed and tested. In the main, the computer hardware was installed, and softwear programs were operational, with only minor debugging being required. GRA

N79-13141# Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
CHARACTERIZATION OF CORROSION FILMS ON LEAD BY INFRARED REFLECTION SPECTROSCOPY M.S. Thesis
Amon Z. Goldfarb, C. W. Brown, and R. H. Heidersbach Aug. 1978 189 p refs
(Contract N00014-76-C-0889)
(AD-A058883; TR-5) Avail: NTIS HC A09/MF A01 CSCL 11/6

This report contains the manuscipt of a thesis by A. Goldfarb, M.S. candidate in Ocean Engineering at the University of Rhode Island. Electrochemical exposures of lead samples in aqueous carbonate, phosphate, sulfate and chloride solutions were made at various pH and potential values. The resulting surface films were investigated by infrared reflection spectroscopy in order to identify the surface species; to show the applicability of the reflection technique to corrosion research. The experimental results were compared to the appropriate theoretical Pourbaix diagram. The experimental results did not always confirm the theoretical prediction mainly due to the lack of the kinetic effect in the Pourbaix diagram calculation. Thicknesses of passive films formed on lead in sulfate solutions were measured. From this the sensitivity of infrared reflection spectroscopy for detecting this type of films was found to be better than 200 angstroms. Infrared reflection spectra were compared to the appropriate transmission spectra and explanations for bands: shift, angle of incidence dependence, and number of reflections are given. Preliminary experiments of high temperature Armco iron exposures are also presented. Author (GRA)

N79-13142# California Univ., Los Angeles. Dept. of Materials.
ON THE AMPLITUDE DISTRIBUTION OF BURST EMISSION DUE TO MnS INCLUSIONS IN HSLA STEELS
Kanji Ono, R. Landy, and C. Ouchi Jul. 1978 15 p refs
(Contract N00014-75-C-0419)
(AD-A058887; TR-78-03) Avail: NTIS HC A02/MF A01 CSCL 11/6

It is well known that the ductility of a steel plate, particularly in the thickness (short transverse) direction, is sensitive to the number, size, shape and distribution of nonmetallic (primarily MnS) inclusions. In this study, acoustic emission behavior was correlated to several inclusion parameters, varied by rolling mill practices and different sulphur levels in the steel used. Burst-type acoustic emission signals were observed in the thickness direction samples. Their numbers and intensity increased with the sulphur content, and also depended on the rolling ratio and finish rolling temperature. The origin of burst emission was established as the decohesion of flattened MnS inclusions. Amplitude distribution of acoustic emission signals was describable by a Weibull distribution. It was also found that the size distribution of MnS inclusions takes an identical form. The two independently determined distributions were correlated by considering the stored elastic strain energy at an inclusion and of the transducer response to mechanical pulse excitation. To explain stress dependence of Acoustic Emission amplitude distribution, the size dependence of decohesion probability was also introduced. Author (GRA)

N79-13143# Martin Marietta Labs., Baltimore, Md.
GRAIN BOUNDARY SEGREGATION IN Al-Zn-Mg ALLOYS--IMPLICATIONS TO STRESS CORROSION CRACKING
R. K. Viswanadham, T. S. Sun, and J. A. S. Green Aug. 1978 32 p refs
(Contract N00014-74-C-0277)
(AD-A059161; MML-TR-78-37C) Avail: NTIS HC A03/MF A01 CSCL 11/6

Prior studies on grain boundary segregation in Al-Zn-Mg have shown that free Mg is present along the grain boundaries in these alloys under all heat-treat conditions. In this paper, further studies on grain boundary segregation in Al-Zn-Mg alloys are outlined. A physical basis for the observed segregation profiles is provided through the vacancy pump model developed by Anthony. The implications of the observed segregation to stress corrosion cracking (SCC) and other environmentally-induced embrittling phenomena (where hydrogen could possibly play a dominant role) are discussed in terms of a possible Mg-H complex formation. A wide body of circumstantial evidence from several areas for such an interaction is provided. The dependence of this segregation on boundary type is explored and texture control is proposed as a possible means of controlling segregation and enhancing resistance to stress corrosion cracking. Author (GRA)

N79-13144# California Univ., Los Angeles. Dept. of Materials.
TEMPERATURE DEPENDENCE OF ACOUSTIC EMISSION IN AN AUSTENITIC STAINLESS STEEL
S-Y. S. Hsu, Kanji Ono, and H. Hatano Sep. 1978 15 p refs
(Contract N00014-75-C-0419)
(AD-A059243; TR-78-04) Avail: NTIS HC A02/MF A01 CSCL 11/6

Temperature dependence of acoustic emission accompanying the plastic deformation of AISI Type 304L austenitic stainless steel was investigated over the range of 300 to 950 K. While the yield and flow stresses decreased, the intensity of acoustic emission increased remarkably by increasing test temperature. The observed behavior was attributed to the transition in the mode of dislocation glide from planar to non-planar, which resulted in a higher instantaneous plastic strain increment. Other implications were also discussed. Author (GRA)

N79-13145# Ocean City Research Corp., N.J.
CORROSION OF 5456-H117 ALUMINUM IN HIGH VELOCITY SEAWATER Final Report, Jun. 1977 - 1978
G. A. Gehring, Jr. Jun. 1978 87 p refs
(Contract N00014-77-C-0431)
(AD-A058814; OCR-ONR-1) Avail: NTIS HC A05/MF A01 CSCL 11/6

A study was undertaken to examine the corrosion behavior of 5456-H117 aluminum in high velocity seawater. Experimental data was obtained using a high velocity flow channel operated with natural seawater. The results show that both the rate and mode of corrosion are velocity-dependent. The corrosion rate was shown to increase significantly with increasing velocity. Morphological changes were observed as a function of velocity. The observed changes suggest that the basic mechanism for high velocity corrosion of 5456-H117 aluminum involves film

disruption/removal leading to enhanced micropitting about intermetallic particles. Author (GRA)

N79-13146# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
MECHANICAL BEHAVIOR OF TITANIUM ALLOYS (THE INFLUENCE OF ALPHA/BETA INTERFACE PHASE ON TENSILE PROPERTIES IN TiGAl-4V) Progress Report, Feb. 1977 - Feb. 1978
C. G. Rhodes and N. E. Paton 23 Jun. 1978 38 p refs
(Contract N00014-76-C-0598)
(AD-A058619; SC5056.2TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The effects of alpha/beta interface phase on room temperature tensile properties in Ti-6Al-4V having an equiaxed primary alpha microstructure have been studied systematically. Due to conditions under which it grows, manipulation of interface phase width results in alteration of the volume fraction of primary alpha in the alloy. Tensile yield strength and elongation were correlated to interface phase width and volume fraction primary alpha. The relative individual influence of each of these microstructural features on properties is not unambiguously clear, but evidence indicates that yield strength increases with increasing interface phase width when the interface phase exceeds about 2500 angstrom and elongation decreases with increasing interface phase width when the interface phase is less than about 2500 angstrom. GRA

N79-13147# Sandia Labs., Livermore, Calif.
MICROSTRUCTURE OF LOW ENERGY DEUTERIUM IMPLANTED STAINLESS STEEL
G. J. Thomas and K. L. Wilson May 1978 14 p refs Presented at the 3d Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Culham, England, 3-7 April 1978
(Contract EY-76-C-04-0789)
(SAND-77-8758; Conf-780467-8) Avail: NTIS HC A02/MF A01

Transmission electron microscopy was used to determine the defect structure produced in stainless steel by deuterium ions of energies from 0.3 to 5 keV. These energies are typical of neutral atoms incident on the first wall of current Tokamak devices. The defect structures coarsened and lattice strain effects in the implanted region became noticeable as the dosage increased. No gas bubbles were observed at low temperatures for deuterium concentrations as high as approximately 10 atom percent. DOE

N79-13148# Idaho National Engineering Lab., Idaho Falls.
EVALUATION OF ROLL-EXTRUDED ALLOY 718 TUBING
G. R. Smolik and G. E. Korth May 1978 44 p refs
(Contract EY-76-C-07-1570)
(TREE-1255) Avail: NTIS HC A03/MF A01

A sample of roll extended alloy 718 tubing, a product identified for use in the Clinch River Breeder Reactor, was evaluated. The tubing satisfied AMS 5589 requirements for seamless tubing, and had tensile and fatigue properties comparable to plate for the conventional 995 C (1750 F) heat treatment. Recrystallization was retarded in the product and bands of very small grains resulted from the conventional heat treatment. Both as roll extruded and directly aged material showed the results of thermomechanical processing in high strengths and reductions in area. It was recommended that work continue toward realizing improved fatigue and stress rupture properties in this by means of Minigrain and thermomechanical processing. DOE

N79-13149# Battelle Columbus Labs., Ohio.
STATE OF THE ART AND SCIENCE REPORT ON DESIGN OF ALLOYS RESISTANT TO HIGH-TEMPERATURE CORROSION-EROSION IN COAL CONVERSION ENVIRONMENTS Interim Report
I. G. Wright and C. W. Price Apr. 1978 140 p refs Sponsored by Electric Power Research Inst.
(EPRI-FP-557) Avail: NTIS HC A07/MF A01

It is concluded that the state of the art of the use of wear-resistant alloys in a large number of corrosive environments is good. There is no acceptable correlation of alloy erosion behavior with alloy properties or microstructure, and there are very available descriptions of the mode of erosion of alloys. DOE

N79-13150# Atomics International Div., Golden, Colo. Rocky Flats Plant.
CASTING LARGE BERYLLIUM INGOTS
R. R. Corle, R. W. Krenzer, and K. E. Voiles 5 Jun. 1978 29 p refs
(Contract EY-76-C-04-3533)
(RFP-2695) Avail: NTIS HC A03/MF A01

A beryllium ingot-sheet fabrication process that includes the development of new techniques to consistently cast large sound beryllium ingots is described. The casting technology that was developed to cast these beryllium ingots on a production basis is assessed along with some of the remaining technical problems requiring additional development work. DOE

N79-13151# National Materials Advisory Board, Washington, D. C.
VANADIUM SUPPLY AND DEMAND OUTLOOK Final Report
1978 144 p refs Sponsored in part by Bureau of Mines and Commerce Dept.
(Contract GS-00-DS-(P)-94008)
(PB-284947/9; NMAB-346) Avail: NTIS HC A07/MF A01 CSCL 08I

The reserves and resources for vanadium minerals in the United States and foreign countries. Foreign sources are presently used to provide a substantial part of national demand because of price advantages. There are so many functioning foreign sources for vanadium that it is difficult to conceive of circumstances that would shut all of them off. The basis for the national stockpile is described. A recommendation is made to add the 65V-35Al alloy as a component of the stockpile for titanium alloy production in a national emergency. Estimated consumption growth rates to 1990 vary from one to five percent per year depending on the end product involved. GRA

N79-13152# Little (Arthur D.), Inc., Cambridge, Mass.
ENERGY USE PATTERNS FOR METAL RECYCLING
Charles L. Kusik and Charles B. Kenahan 1978 196 p refs
(PB-284855/4; BUMINES-IC-8781) Avail: NTIS MF A01; HC SOD CSCL 11F

Data were collected on energy requirements to recycle prompt industrial and obsolete scrap for nine metal commodities: iron and steel, aluminum, copper, zinc, lead, stainless steel, titanium, tin, and nickel and nickel alloys. Major process routes for recycling were considered, starting from the first collection point through scrap preparation, transportation, smelting and/or refining to the molten metal, ingot, or other semi-finished form approximately equivalent to a primary metal of a similar composition. Available data for 1976 were collected on the amounts of each metal commodity recycled by major scrap categories. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N79-13153 New York Univ., N. Y.
THE STATISTICAL THERMODYNAMICS OF POLYMER SOLUTIONS AT FINITE CONCENTRATIONS Ph.D. Thesis
Marijo Anne Gillen 1978 369 p
Avail: Univ. Microfilms. Order No. 7824222

Polymer solutions at finite concentrations were studied by a Monte Carlo method on a CDC 6600 computer using a set of programs explicitly written for this purpose. The model for the polymer solution was a cubic lattice with periodic boundaries. On this lattice, nonintersecting random walks were grown by a Monte Carlo method to simulate the positions of the polymer molecules. The positions not occupied by polymer molecules were considered to be occupied by solvent molecules. The energy of interaction between any two sites in the system was a constant so that the solution was athermal. Solutions of 1, 2, 3, 4, and 5 polymers, or walks, were investigated on cubic lattices of edge length, or box size, 30, 20, and 15 and a solution of 1 walk was studied at a box size of 60. For all box sizes, the length n of the walks was approximately 330, 165, 110, 83,

and 66 steps for 1, 2, 3, 4, and 5 walks, respectively.
Dissert. Abstr.

N79-13154 Delaware Univ., Newark.
INFRARED AND KINETIC STUDY OF POLYMER-BOUND RHODIUM CLUSTER CATALYSTS FOR HYDROGENATION Ph.D. Thesis
Michael Scott Jarrell 1978 232 p
Avail: Univ. Microfilms Order No. 7816929

Polymers prepared by ligand exchange of poly (styrenedivinylbenzene) membranes containing bound -PPh2 groups and Rh6(CO)16 were found to be active catalysts for the hydrogenation of ethylene and of cyclohexene at 75 C and 1 atm. Metal carbonyl bands in the infrared spectrum suggested that the hexarhodium cluster structure was maintained intact as it was attached to the polymer. In the presence of olefin at 0.1 atm partial pressure and hydrogen at 0.9 atm partial pressure, ethylene and cyclohexene were converted solely to ethane and cyclohexane, respectively, at rates of about 0.1 molecules per second per rhodium atom in the catalyst. The kinetics of cyclohexene hydrogenation catalyzed by the polymer-bound cluster were second order in cyclohexene partial pressure and one-half order in hydrogen partial pressure, and the activation energy of the reaction was 7 kcal/mole.
Dissert. Abstr.

N79-13155 Michigan Univ., Ann Arbor.
EFFECTS OF CROSSLINKING AND CHAIN-RIGIDITY ON THE STRUCTURE OF NONCRYSTALLINE POLYMERS Ph.D. Thesis
Chen-Shih Wang 1978 160 p
Avail: Univ. Microfilms Order No. 7823035

The dependence of crosslinking and chain-rigidity on the physical arrangement of macromolecules in the amorphous state was examined, with the objective of achieving a better understanding of the molecular organization of noncrystalline polymers. The study was based on a detailed analysis of the differential radial distribution function (DRDF) derived from wide angle X-ray scattering data. High-energy radiation was employed to crosslink natural rubber (NR), atactic polypropylene (aPP), and radiation-amorphotized isotactic polypropylene (iPP). The polymers were chosen because NR crosslinks predominantly while polypropylene (PP) undergoes both crosslinking and degradation in comparable amounts.
Dissert. Abstr.

N79-13156 Wisconsin Univ. - Madison.
NON-AFFINE MOTIONS IN THE MOLECULAR THEORY OF POLYMER LIQUIDS Ph.D. Thesis
Daniel Joseph Segalman 1978 275 p
Avail: Univ. Microfilms Order No. 7817129

The molecular theories for polymer melts and solutions are reexamined, and similarities in the postulates of the two theories are sought. A commonality in the kinematic assumptions of the two theories is recognized. The assumption is that the kinematics imposed on the macroscopic continuum is transmitted undistorted to some component of the molecular mechanics. When the simplest possible alternative kinematics are substituted into the constitutive equations derived from the molecular theory of Rouse and from the classical theory of rubber elasticity, a linear non-affine model results. The linear non-affine model is found to predict the properties of polymer liquids extraordinarily well. Specifically, viscosity and normal stress curves are predicted quantitatively correctly.
Dissert. Abstr.

N79-13157 Vanderbilt Univ., Nashville, Tenn.
GLASS AND GLASS-CERAMICS IN THE PbO-Nb2O5-P2O5 SYSTEM: DIELECTRIC PROPERTIES Ph.D. Thesis
Robert Stephen Rea 1978 158 p
Avail: Univ. Microfilms Order No. 7823465

Glasses and glass-ceramics were prepared from the oxides of lead, barium, niobium, and phosphorus. Compositions included: glasses with 24 to 30 mol% P2O5 part of the PbO replaced with BaO, and a niobium phosphate glass containing 70 mol% Nb2O5. Wet chemical analysis gave glass compositions within 2% of the batch mixtures. The glasses, prepared without rapid quenching, were physically strong and chemically durable; dielectric properties were stable for years. An X-ray diffraction analysis indicated no crystallinity in the lead niobium glasses; the niobium phosphate glass possibly contained very small crystals, or was phase-separated. The dielectric properties compare quite favorably with those of commercial silicate glass-ceramics containing Pb, Nb, Ba, and Sr.
Dissert. Abstr.

N79-13158*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATION AND FAILURE MECHANISMS OF MOLYBDENUM DISULFIDE FILMS. 1: EFFECT OF ATMOSPHERE
Robert L. Fusaro Dec. 1978 29 p
(NASA-TP-1343; E-9600) Avail: NTIS HC A03/MF A01 CSCL 11H

Friction, wear, and wear lives of rubbed molybdenum disulfide (MoS2 films applied to sanded 440C HT steel surfaces were evaluated in moist air, dry air, and dry argon. Optical microscope observations were made as a function of sliding distance to determine the effect of moisture and oxygen on the lubricating and failure mechanisms of MoS2 films. In general, the lubrication process consisted of the formation of a thin, metallic colored, coalesced film of MoS2 that flowed between the surfaces in relative motion. In air, failure was due to the transformation of the metallic colored, coalesced films to a black, powdery material. Water in the air appeared to accelerate the transformation rate. In argon, no transformation of MoS2 was observed with the microscope, but cracking and spalling of the coalesced film occurred and resulted in the gradual depletion of the film.
Author

N79-13159*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATION AND FAILURE MECHANISMS OF MOLYBDENUM DISULFIDE FILMS. 2: EFFECT OF SUBSTRATE ROUGHNESS
Robert L. Fusaro Dec. 1978 30 p refs
(NASA-TP-1379; E-9715) Avail: NTIS HC A03/MF A01 CSCL 11H

An optical microscope was used to study the lubrication and failure mechanisms of rubbed MoS2 films applied to three substrate surface finishes; polished, sanded, and sandblasted as a function of sliding distance. The lubrication mechanism was the plastic flow of thin films of MoS2 between flat plateaus on the rider and on the metallic substrate. If the substrate was rough, flat plateaus were created during run-in and the MoS2 flowed across them. Wear life was extended by increasing surface roughness since valleys in the roughened substrate served as reservoirs for MoS2 and as deposit sites for wear debris. In moist air the failure mechanism was the transformation of metallic colored MoS2 films to a black, powdery material that was found by X-ray diffraction to be alpha iron, MoO3, and possibly FeMoO3. In dry argon the failure mechanism was the gradual depletion of MoS2 from the contact region by transverse flow, and the wear debris on the track at failure was alpha iron, residual MoS2, and possibly FeS.
Author

N79-13160*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SIALONS AS HIGH TEMPERATURE INSULATORS
W. M. Phillips and Y. S. Kuo 1 Dec. 1978 32 p refs
(Contract NAS7-100)
(NASA-CR-157838; JPL-Pub-78-103) Avail: NTIS HC A03/MF A01 CSCL 11B

Sialons were evaluated for application as high temperature electrical insulators in contact with molybdenum and tungsten components in hard vacuum applications. Both D.C. and variable frequency A.C. resistivity data indicate the sialons to have electrical resistivity similar to common oxide in the 1000 C or higher range. Metallographic evaluations indicate good bonding of the type 15R ALN polytype to molybdenum and tungsten. The beta prime or modified silicon nitride phase was unacceptable in terms of vacuum stability. Additives effect on electrical resistivity. Similar resistivity decreases were produced by additions of molybdenum or tungsten to form cermets. The use of hot pressing at 1800 C with ALN, Al2 O3 and Si3N4 starting powders produced a better product than did a combination of SiO2 and AlN staring powders. It was indicated that sialons will be suitable insulators in the 1600K range in contact with molybdenum or tungsten if they are produced as a pure ceramic and subsequently

bonded to the metal components at temperatures in the 1600K range. B.B.

N79-13161# Naval Research Lab., Washington, D. C.
SHOCK AND VIBRATION PERFORMANCE OF AN EPOXY CHOCKING COMPOUND CHOCKFAST ORANGE, PR-610CF (PHILADELPHIA RESINS CORP.) Final Report, Oct. 1976 - Sep. 1977
E. W. Elements Jun. 1978 44 p refs
(AD-A058589; AD-E000202; NRL-MR-3795) Avail: NTIS HC A03/MF A01 CSCL 13/13

In recent years, some equipment items have been installed on board Navy combatant vessels with chocks cast from epoxy chocking compounds. Since Navy combatants are characterized by severe shock and vibration environments, it is necessary to demonstrate that epoxy chocks can tolerate such environments. This report describes a series of tests in which structures resembling shipboard equipment items in mechanical features were mounted on epoxy chocks cast from one of the commercially available compounds. These structures were subjected to shock and vibration tests in accordance with the specifications required for acceptance of equipment items for installation on Navy combatants. These tests had no effect on the chocks which would be likely to impair their function. Damage was limited to some minor cracking and fragmentation which did not extend into load-bearing areas. It is conceivable, however, that installation between very flexible members could lead to more wide-spread cracking and fragmentation. The use of chocks of any description may also have the effect of introducing a spring element into the equipment foundation, and the potential influence of this on the equipment response to shock and vibration excitation should be considered. Author (GRA)

N79-13162# Pennsylvania Univ., Philadelphia. Lab. for Research on the Structure of Matter.
CONDUCTING POLYMERS: HALOGEN DOPED POLYACETYLENE Interim Technical Report
C. K. Chiang 5 Aug. 1978 34 p refs
(Contract N00014-75-C-0962)
(AD-A058373; LRSM-TR-78-5) Avail: NTIS HC A03/MF A01 CSCL 07/3

A study of the electrical conductivity of the halogen doped trans-polyacetylene system (CH)x, is reported. When films of trans-(CH)x are exposed to chlorine, bromine or iodine vapor, uptake of halogen occurs, and the conductivity increases markedly, over eight orders of magnitude in the case of iodine. The behavior of the halogenated polyacetylene is like that of a series of semiconductors with activation energies which vary with halogen content. The heavily doped polyacetylene shows metallic behavior with the semiconductor-metal transition near 2-3% dopant concentration. The results are discussed in terms of a model of the doping process based on charge transfer. Author (GRA)

N79-13163# Westinghouse Research and Development Center, Pittsburgh, Pa.
OVERAGE INDICATOR FOR GRAPHITE FIBER EPOXY Final Report, 15 Jun. 1977 - 14 Jun. 1978
Z. N. Sanjana Jun. 1978 83 p refs
(Contract N00019-77-C-0247)
(AD-A059004) Avail: NTIS HC A05/MF A01 CSCL 11/2

Prepreg or B-staged products are used extensively in the aerospace, electrical, and communications industries. They consist of a partially reacted mixture of monomers which have been impregnated into the reinforcement. During shipping and storage, prior to use, the reactions will continue. The amount of reaction or 'age' of the prepreg will depend on the conditions (principally, temperature and time) that it has been exposed to. These conditions are often unknown. At a point in the age of the prepreg, some critical property or properties will deteriorate. This would then represent the end of the useful life of the prepreg. The critical property will often depend upon the material and the end use intended of the prepreg. The overage indicator may then be the critical property itself or some other measurement which tracks the age of the prepreg and correlates well with the loss of the critical property. The latter affords more flexibility and generality of application to many products. GRA

N79-13164# Massachusetts Univ., Amherst.
PREPARATION AND EVALUATION OF EXACTLY ALTERNATING SILARYLENE-SILOXANE ELASTOMERS Annual Report
Robert W. Lenz and Petar R. Dvornic 1 Aug. 1978 33 p refs
(Contract N00014-76-C-0700)
(AD-A058890; AR-2) Avail: NTIS HC A03/MF A01 CSCL 11/9

Four monomers needed for the preparation of exactly alternating silarylene-siloxane polymers of high molecular weight were prepared in high purity. The polymerization reaction based on the combination of a disilanol monomer (either the p-phenylene or the p,p1 diphenyl ether) with a diureidosilane monomer (either the dimethyl or the methylvinyl) was applied successfully to the preparation of polymers and copolymers having weight average molecular weights greater than 100,000. A particularly important problem in these preparations was the stability of the ureidosilane monomer. The glass temperatures of the two dimethylsiloxane-diol homopolymers as determined by DSC were -64 and -24 C for the p-phenylene and the p,p diphenyl ether polymers, respectively. The thermal stabilities of these homopolymers and copolymers as determined by TGA were fairly simple in behavior in nitrogen but quite complex in air. Incorporation of the methylvinylsiloxane units into the exactly alternating copolymers resulted in considerable increases in thermal stability. Author (GRA)

N79-13165# Dayton Univ., Ohio. Dept. of Chemistry.
STRUCTURAL STUDIES OF MONOMERIC MODEL COMPOUNDS AND RELATED ORDERED POLYMER SYSTEMS: THE CRYSTAL AND MOLECULAR STRUCTURES OF 2,6-DIPHENYLBENZO [1,2-d:5,4-d']-BISOXAZOLE AND 2,6-DIPHENYLBENZO [1,2-d:4,5-d'] BISTHIAZOLE Final Report, 15 Apr. 1977 - 14 Apr. 1978
Albert V. Fratini 14 Jun. 1978 29 p refs
(Grant AF-AFOSR-3267-77; AF Proj. 2303)
(AD-A059019; AFOSR-78-1173TR) Avail: NTIS HC A03/MF A01 CSCL 11/9

The Materials Laboratory at Wright-Patterson Air Force Base is presently investigating the applicability of ordered polymer systems as self-reinforced polymer composites. The preparation of high strength materials consisting of rod-like polymers, such as Kevlar, requires a high degree of orientation of the rods. Of the numerous rod-like polymer systems that have been studied to date, the paraconfigured aromatic heterocyclic class of polymers, such as the polybenzoxazoles (PBO) and the polybenzthiazoles (PBT), are especially promising since precipitated films and fibers of these materials exhibit high tensile strengths and good thermal oxidative stabilities. These systems are also excellent alternatives to the more widely known aromatic polyamides, such as Kevlar and Nomex. GRA

N79-13166# Goodyear Aerospace Corp., Litchfield Park, Ariz.
SUPERHARD TRANSPARENT COATINGS Final Technical Report, Nov. 1975 - Feb. 1977
Robert L. Fogarty, Richard S. Hassard, John Yram, Jr., and Glenn E. Wintermute Jun. 1978 116 p refs
(Contract DAAJ02-76-C-0004; DA Proj. 1F2-62209-AH-76)
(AD-A059079; GERA-2306; USARTL-TR-78-19) Avail: NTIS HC A06/MF A01 CSCL 11/3

Army helicopter glazings have been particularly susceptible to windshield damage from wiper abrasion and dust clouds generated by the rotor vortex, as evidenced by Army operational service experience. The short life expectancy of acrylic windows required frequent and expensive replacement. The purpose of this program was to evaluate transparent hard coatings which would extend the service life of new glazings, and possibly, through resurfacing, some panels already in service. The first requirement was to choose, through a series of tests, the better of several formulations developed by the Marks Polarized Corporation. The coating chosen was then to be field tested on full-scale helicopter glazings. Problems with the formulations resulted in unsuccessful attempts at modification and ultimately, the development of new formulations which are now ready for field testing. This final report concerns theoretical chemistry, the problems encountered in developing a serviceable coating, the laboratory test results of both old and new formulations and

recommendations for full-scale processing. Appendixes to this report contain test methods and equipment used in the testing sequences which are not found in standard procedures.
Author (GRA)

N79-13167# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
LOW-TEMPERATURE DIFFERENTIAL SCANNING CALORIMETRY OF POLYSILOXANES Interim Report
William J. Verzino and Robert W. Fillers 22 Aug. 1977 33 p
(Contract F04701-77-C-0078)
(AD-A059189; TR-0078(3950-01)-1; SAMSO-TR-78-107)
Avail: NTIS HC A03/MF A01 CSCL 11/2

Low-temperature differential scanning calorimetry (DSC) was used to determine the temperature region of glass formation or the crystallization of polysiloxanes or both. Research- and commercial-grade polysiloxanes were characterized by DSC to determine where significant physical property changes, such as embrittlement or shrinkage, had occurred. The effect of the thermal history, cooling-heating rate, and molecular weight distribution on thermodynamic behavior was investigated. An illustrative example of the failure analysis of a low-temperature adhesive used on a solar panel is included. Author (GRA)

N79-13168# Army Materials and Mechanics Research Center, Watertown, Mass.
EVALUATION OF SUPERHARD TRANSPARENT COATINGS Final Report
J. R. Plumer Feb. 1978 19 p
(DA Proj. 1F2-62209-AH-76)
(AD-A059156; AMMRC-TR-78-10) Avail: NTIS HC A02/MF A01 CSCL 11/3

A test program was carried out to assess hard surface coatings developed for reducing scratching problems encountered with plastic glazings used in Army aircraft. The tests employed simulated aircraft flight and handling conditions, and consisted of the following: a windshield wiper test, a felt-pad abrader test, solvent resistance, hardness, impact, ultraviolet exposure, humidity, and weatherometer testing. The coatings were found to substantially increase the abrasion resistance of several types of plastic materials; water and ultraviolet radiation were factors adversely affecting coating performance. Author (GRA)

N79-13169# Tennessee Univ., Knoxville. Polymer Engineering.
IMPOSED POLYELECTROLYTE BEHAVIOR OF POLY (M-PHENYLENE ISOPHTHALAMIDE) IN LiCl/DIMETHYLACETAMIDE Technical Report, 1 Apr. 1977 - 11 Sep. 1978
Daniel D. Harwood and John F. Fellers Sep. 1978 30 p refs
(Contract N00014-77-C-0236)
(AD-A059144; PSE-119; TR-2) Avail: NTIS HC A03/MF A01 CSCL 11/9

The dilute solution viscometric behavior of poly(m-phenylene isophthalamide) dissolved in LiCl/dimethylacetamide was studied. Important aspects of this investigation included interactions between dimethylacetamide and LiCl, polymer-polymer association, and the capability of poly(m-phenylene isophthalamide) to become a polyion when dissolved in LiCl/Dimethylacetamide. Counterion interaction with the polyion and the ability to control the ion concentration gave rise to interesting variations in the hydrodynamic volume of poly(m-phenylene isophthalamide) leading to a maximum in its intrinsic viscosity as a function of LiCl concentration. Author (GRA)

N79-13170# Brandeis Univ., Waltham, Mass. Dept. of Chemistry.
SIMULTANEOUS POLYMERIZATION AND CRYSTALLIZATION: A NEW METHOD FOR THE PREPARATION OF MIXED-METAL COORDINATION POLYMERS Interim Technical Report
Bruce M. Foxman and Susan W. Gersten Aug. 1978 9 p refs
(Contract N00014-76-C-0822)
(AD-A059056; TR-4) Avail: NTIS HC A02/MF A01 CSCL 07/3

The usefulness of simultaneous polymerization and crystallization as a preparative tool for tansition metal polymers is established; syntheses of both stable and metastable mixed-metal (M = Ni,Co) polymers are described. The metastable polymers show solid-state reactivity as well as room-temperature photochromism. GRA

N79-13171# Union Carbide Corp., Tarrytown, N.Y. Medical Products Div.
THE PREPARATION AND PROPERTIES OF D2-M-CARBORANESILOXANE POLYMERS Final Report, 1972-1978
K. A. Barker, C. D. Beard, J. J. Bohan, G. B. Dunks, E. Hedaya, B. L. Joesten, J. H. Kawakami, P. W. Kopf, G. T. Kwiatkowski, D. W. McNeil et al Jul. 1978 129 p refs
(Contract N00014-72-C-0277)
(AD-A059057; MPD-T-871) Avail: NTIS HC A07/MF A01 CSCL 11/10

Linear D2-m-carboranesiloxane polymers (M sub w = 150,000-250,000) were prepared from 1,7-bis (hydroxydimethylsilyl)-m-carborane and bis(n-phenyl-N:,N:-tetramethyleneureido)dialkylsilanes as condensation monomers. Improved methods of monomer preparation and purification were developed. The polymers exhibit outstanding high temperature stability and retention of elastomeric behavior. The preferred central silicon substitution pattern is 67% dimethyl-33% methylphenyl. Filled and cured vulcanizates gave long-term elastomeric performance from -25 C to > or = 300 C. The preferred fillers are hydrophobic silicas, the preferred curing agents are peroxides, and the preferred antioxidant is ferric oxide. Radiation resistance, flammability, and solvent resistance were evaluated; 3,3,3-trifluoropropyl groups were introduced to enhance the latter. Synthesis of a specifically carboranesilanol-terminated polymer allowed preparation of ultra-high molecular weight polymer M = 1 million and alternating block copolymers; however, its synthesis proved difficult to reproduce for unidentified reasons.
Author (GRA)

N79-13172# Norton Co., Worcester, Mass.
DEVELOPMENT OF NONDESTRUCTIVE TESTING TECHNIQUES FOR HIGH PERFORMANCE CERAMICS Final Report, 20 Oct. 1976 - 20 Oct. 1977
H. R. Baumgartner, R. H. Brockelman, and P. M. Hanson Jan. 1978 106 p refs
(Contract DAAG46-76-C-0022)
(AD-A059063; AMMRC-TR-78-11) Avail: NTIS HC A06/MF A01 CSCL 11/2

Two ceramic materials, a hot-pressed silicon nitride and a siliconized silicon carbide, were manufactured with seeded particulates to evaluate the effectiveness of existing nondestructive test practices for defect detection in ceramics and to evaluate the effect of inclusions upon material strength. The types of seeded defects were of greater and lower density relative to the matrix materials and ranged in size from approximately 0.1 mm to 0.6 mm. The nondestructive methods used in the investigation were ultrasonics, radiography, eddy current and penetrant. Bend bar specimens were cut from the seeded regions of the billets and tested at 25C, 1093C and 1371C. Fracture origins were examined by optical and electron microscopy and by microprobe to correlate the nature of the fracture initiating defects with the nondestructively detected defects. This permitted a ranking of defect detection sensitivity and defect effect upon strength. Author (GRA)

N79-13173# Imass, Inc., Accord, Mass.
DEVELOPMENT OF ELECTRONICS, MECHANICAL FIXTURES AND COMPUTER SOFTWARE FOR AUTOMATION OF DYNAMIC MECHANICAL MEASUREMENTS ON POLYMER SOLIDS AND COMPUTER REDUCTION OF DATA Final Technical Report
E. J. Tolle 28 Aug. 1978 73 p refs
(Contract N00014-77-C-0421)
(AD-A058800; Rept-1-78) Avail: NTIS HC A04/MF A01 CSCL 11/4

The objective of this work is to automate data taking and data reduction on a Rheovibron Dynamic Viscoelastometer. A computer program with the necessary hardware has been developed to control tension on the sample, to monitor power to heaters, to control a temperature scan, and to acquire data on polymeric solids from which temperature dependence of a

dynamic modulus and tangent of the loss angle (tan delta) can be calculated. Author (GRA)

N79-13174# Pennsylvania Univ., Philadelphia. Lab. for Research on the Structure of Matter.
ANISOTROPIC OPTICAL PROPERTIES OF PURE AND DOPED POLYACETYLENE Interim Technical Report
D. L. Peebles, A. J. Heeger, A. G. MacDiarmid, H. Shirakawa (Tokyo Inst. of Technol., Japan), S. Ikeda (Tokyo Inst. of Technol., Japan), C. R. Fincher, Jr., M. A. Druy, and Y. Mattsumura 6 Aug. 1978 22 p refs Submitted for publication
(Contract N00014-75-C-0962; NR Proj. 356-602)
(AD-A058374; LRSM-TR-78-6) Avail: NTIS HC A02/MF A01 CSCL 07/4

Optical absorption and reflection measurements have been carried out on pure and doped polyacetylene films. The absorption data are consistent with a model of (CH)x as a direct gap quasi-id semiconductor; doping with AsF5 or iodine introduces absorption within the gap, but appears to leave the interband transition intact. The anisotropic reflectance from partially aligned films and the increased optical anisotropy upon doping provide evidence of quasi-id behavior of the semiconducting pure polymer and the metallic doped polymer. Author (GRA)

N79-13175# Pennsylvania Univ., Philadelphia. Lab. for Research on the Structure of Matter.
ANISOTROPIC ELECTRICAL CONDUCTIVITY OF PARTIALLY ORIENTED POLYACETYLENE Interim Technical Report
Y. W. Park, M. A. Druy, C. K. Chiang, A. G. MacDiarmid, A. J. Heeger, H. Shirakawa (Tokyo Inst. of Technol., Japan), and S. Ikeda (Tokyo Inst. of Technol., Japan) 7 Aug. 1978 20 p refs Submitted for publication
(Contract N00014-75-C-0962; NR Proj. 356-602)
(AD-A058378L; LRSM-TR-78-7) Avail: NTIS HC A02/MF A01 CSCL 07/4

Partial orientation of the fibers in polycrystalline films of (CH)x leads to significant improvement in the transport properties and to the introduction of electrical anisotropy. GRA

N79-13176# Pennsylvania Univ., Philadelphia. Lab. for Research on the Structure of Matter.
POLYACETYLENE, (CH) SUB X:N-TYPE AND P-TYPE DOPING AND COMPENSATION Interim Technical Report
C. K. Chiang, S. C. Gau, C. R. Fincher, Jr., Y. W. Park, and A. G. MacDiarmid 4 Aug. 1978 18 p refs
(Contract N00014-75-C-0962)
(AD-A058372; LRSM-TR-78-4) Avail: NTIS HC A02/MF A01 CSCL 07/4

A series of experiments are reported which demonstrate that donors or acceptors can dope polyacetylene to n-type or p-type respectively, and that the two kinds of dopants can compensate one another. The formation of a rectifying p-n junction is demonstrated. The results suggest the possibility of utilizing doped polyacetylene in a variety of potential semiconductor device applications. Author (GRA)

N79-13177# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
OXIDATIVE STABILIZATION OF ACRYLIC FIBERS. 2: MORPHOLOGY OF POLYACRYLONITRILE
S. B. Warner, L. H. Peebles, Jr., and D. R. Uhlmann Aug. 1978 30 p refs
(Contract N00014-75-C-0542; NR Proj. 356-534)
(AD-A058639; TR-11) Avail: NTIS HC A03/MF A01 CSCL 11/5

A new model for the structure of oriented acrylic fibers is presented. The polyacrylonitrile molecules (or the acrylic sequences in a copolymer) are suggested to form two distinct regions within a fibril amorphous (disordered) and partially ordered. In the partially ordered regions, the polymer molecules assume a contorted helical shape to form rods with a diameter averaging about 6.0A in which the nitrile units are oriented at various angles to the rod axis, but are spaced irregularly on or near the surface of the rod. The nitrile groups of adjacent rods can interpenetrate to form dipole pairs. The rods are ordered into a liquid crystal-type array, giving in some cases a lamellar-like texture oriented perpendicular to the fibril axis, with the ordered lamellae regions interspersed with amorphous regions. Evidence for the structure is obtained from transmission electron microscopy observations, a transient peak observed in small angle X-ray scattering when fibers are thermally treated, as well as wide angle X-ray diffraction patterns. The proposed model is consistent with the absence of a periodic repeat unit along the chain direction, with the hkO reflections seen in wide angle X-ray and electron diffraction, with the spherulitic morphology reported in some studies, and with the plate-like morphologies obtained under some conditions of precipitation from dilute solution. Author (GRA)

N79-13178# McGraw-Edison Co., Franksville, Wis.
EXTREMELY HIGH STRENGTH PORCELAIN Final Report
J. E. Schroeder and J. P. Guertin Apr. 1978 85 p refs
(EPRI Proj. 427-1)
(EPRI-EL-722) Avail: NTIS HC A05/MF A01

A high strength electrical porcelain was developed using inexpensive raw materials and standard porcelain manufacturing methods. This was accomplished by reinforcing the glassy phase with strong needle-shaped crystals of mullite, which were grown during the firing cycle. An additional increase in strength was gained by decreasing the closed porosity of the fired material to nearly zero. The breaking strengths of unglazed samples were 25,000 to 30,000 psi, compared to 10,000 psi for standard electrical porcelain. The electrical properties of this material are approximately equivalent to those of standard procelain. The cost of this material is approximately two cents per pound (5) percent) higher than standard porcelain due to increased raw materials costs and a small additional labor cost. Advantages of high strength porcelain are smaller and lighter insulators, less chance of breakage, increased safety and therefore a savings in total cost to the utility user. DOE

N79-13179# National Technical Information Service, Springfield, Va.
CYANOACRYLATE TISSUE ADHESIVES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1978
Elizabeth A. Harrison Sep. 1978 57 p Supersedes NTIS/PS-77/0941; NTIS/PS-76/0836; NTIS/PS-75/440
(NTIS/PS-78/1023/7; NTIS/PS-77/0941; NTIS/PS-76/0836; NTIS/PS-75/440) Avail: NTIS HC $28.00/MF $28.00 CSCL 06L

The selected abstracts are related to cyanoacrylate tissue adhesives. Topics covered include applications, properties, and synthesis of the materials. (This updated bibliography contains 53 abstracts, none of which are new entries to the previous edition.) GRA

N79-13180# National Technical Information Service, Springfield, Va.
THE SYNTHESIS AND PROPERTIES OF POLYURETHANE RESINS, VOLUME 2: A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1973 - Oct. 1978
Diane M. Cavagnaro Oct. 1978 268 p Supersedes NTIS/PS-77/0981; NTIS/PS-76/0922; NTIS/PS-75/745
(NTIS/PS-78/1092/2; NTIS/PS-77/0981; NTIS/PS-76/0922; NTIS/PS-75/745) Avail: NTIS HC $28.00/MF $28.00 CSCL 11I

Topics covered include the synthesis, polymerization, casting, chemical properties, physical properties, and mechanical properties of urethane resins used in such applications as adhesives, solid propellants, coatings, biomaterials, structural members, and sealers. Studies on urethane foams are excluded. (This updated bibliography contains 264 abstracts, 37 of which are new entries to the previous edition.) GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N79-13181*# Marquardt Corp., Van Nuys, Calif.
EVALUATION OF THE SSRCT ENGINE WITH HYDRAZINE AS A FUEL, PHASE 2 Final Report

Stan J. Minton Oct. 1978 57 p refs Prepared for JPL
(Contract JPL-954468)
(NASA-CR-157956; S1440) Avail: NTIS HC A04/MF A01 CSCL 21I

Test firing of the Space Shuttle Reaction Control Thruster (SSRCT) was conducted to determine the characteristic velocity and chamber throat temperatures when the fuel is changed from monomethylhydrazine (MMH) to hydrazine. Thruster performance with hydrazine was essentially as predicted. Characteristic velocity at a mixture ratio of 1.4 (equal volumetric flow) for hydrazine was 5180 feet/second compared with 5110 feet/second at a mixture of 1.6 for MMH. Specific impulse with 22:1 nozzle is calculated to be 280 lbf-sec/lbm. Thermal performance, as measured by chamber throat temperature, was dramatically different (colder) than predicted. Throat temperatures of 2330 F were predicted from a cooling model which assumed a reactive liquid cooling film. Throat temperatures of 800 - 1000 F were measured. An attempt to reconcile the differences between film cooling predictions and the measurements, indicated that an evaporation (nonreactive fluid) model rather than a decomposition (reactive fluid) model best fits the test data at O/F = 1.4. At higher mixture ratios, a transition to temperatures typical of the reactive fluid model were observed.
Author

N79-13182# Naval Research Lab., Washington, D. C. Combustion and Fuels Branch.
FURTHER STUDIES OF FUELS FROM ALTERNATE SOURCES: FIRE EXTINGUISHMENT EXPERIMENTS WITH JP-5 JET TURBINE FUEL DERIVED FROM SHALE Final Report
Robert N. Hazlett, Wilbur A. Affens, G. W. McLaren, and Clement S. Butler May 1978 13 p refs
(WF57571301)
(AD-A058586; AD-E000199; NRL-MR-3780) Avail: NTIS HC A02/MF A01 CSCL 21/4

Fire extinguishment experiments with JP-5 jet fuels derived from shale crude oil and also from petroleum (for comparison) were conducted at NRL's Chesapeake Bay facility. The experiments were conducted in a 40-foot diameter circular pool using Awueous Film Forming Foam (AFFF) as the fire extinguishing agent. The results with both types of fuel were similar, and it was concluded that the techniques and agents for AFFF application, which have been developed for petroleum fuel fires, can also be used for shale derived jet fuel.
Author (GRA)

N79-13183# Naval Air Propulsion Test Center, Trenton, N.J. Propulsion Technology and Project Engineering Dept.
PERFORMANCE OF HOT FUEL IN A SINGLE TUBE HEAT EXCHANGER TEST RIG Final Report
Raymond J. Delfosse Aug. 1978 31 p ref
(AD-A058744; NAPC-PE-11) Avail: NTIS HC A03/MF A01 CSCL 21/4

A single tube heat exchanger test rig was utilized to establish the effects of fuel heating upon fuel degradation. Fuel degradation effects were determined by weighing fuel deposits within the heat exchanger tube and measuring the change in heat exchanger effectiveness ratio. Fuels of varying thermal oxidative stability characteristics were tested and a relationship was developed between those characteristics and the performance of the fuels in the heat exchanger rig.
Author (GRA)

N79-13184# Space Sciences, Inc., Monrovia, Calif.
A MASS-SPECTROMETRIC INVESTIGATION OF THE CHEMISTRY OF ADVANCED COMPOSITE AND DOUBLE BASE PROPELLANTS Annual Summary Report
Milton Farber and R. D. Srivastava Aug. 1978 46 p refs
(Contract N00014-75-C-0986)
(AD-A058578) Avail: NTIS HC A03/MF A01 CSCL 21/9

The results of a mass spectrometric study of several advanced propellants to determine the chemistry and kinetics of their decomposition are presented. The technical program involved three propellant groups: (1) minimum smoke composite and HMX formulations containing approximately 1% each of lead oxide and carbon black; a smokeless double base propellant containing Pb2O3 and carbon black; (2) advanced lead additive formulations; and (3) RDX propellant.
Author (GRA)

N79-13185# Naval Academy, Annapolis, Md.
SYNTHESIS AND PHOTOLYSIS OF MODEL COMPOUNDS FOR MECHANISTIC STUDIES OF 1, 3, 5-TRINITRO-1, 3, 5-TRIAZACYCLOHEXANE (RDX) DECOMPOSITION Final Report, 1977-1978
Scott L. Stafford 1 Jun. 1978 34 p refs
(AD-A058678; USNA-TSPR-96) Avail: NTIS HC A03/MF A01 CSCL 19/1

This work has studied the photochemistry of nitramines. Initially, the synthesis of three nitramines which have similar properties to 1-3-5-trinitro-1-3-5-triazacyclohexane (RDX) was performed. The three compounds were: N-nitropiperidine, N-N-dinitro-piperazine, and 1-3-dinitro-1-3-diazacyclohexane. They were characterized by their infrared and NMR spectra, and by comparison of their physical properties with literature values. The photochemistry of N-nitropiperidine and N-N-dinitropiperazine was conducted in a quartz cell using a Hanovia medium pressure, mercury-arc, immersion lamp (200w). The functionality of the decomposition products led to the proposal of a mechanism which describes the photochemical decomposition of cyclic nitramines.
Author (GRA)

N79-13186# SRI International Corp., Menlo Park, Calif.
DESENSITIZATION OF EXPLOSIVE MATERIALS Summary Report, 15 May 1977 - 14 May 1978
John M. Guimont and Marion E. Hill 15 Jul. 1978 47 p refs
(Contract N00014-76-C-0810; NR Proj. 093-056; Sci Proj. PYU-5374)
(AD-A058467) Avail: NTIS HC A03/MF A01 CSCL 19/1

The Armed Services have continuing problems with explosive materials with regard to their optimum formulation, end-use fabrication, toxicity, irregular burning, and premature detonation. Of these problems, accidental initiation of explosives has been one of the most formidable for research and technology developments to overcome. Because many approaches to the solution of hazard problems have become standardized, few new advances have been made to desensitize explosive ingredients. However, in earlier work for Lawrence Livermore Laboratory, desensitization of bis(Fluorodinitroethyl) formal (FEFO) was achieved by substituting the hydrogen of the aldehydic carbon, OCH2O-, with fluorine to produce bis(fluorodinitroethyl) difluoroformal (DFF).
Author (GRA)

N79-13187# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
HYDROGEN PRODUCTION USING FUSION ENERGY AND THERMOCHEMICAL CYCLES
Meyer Steinberg and Vi-Duong Dang Feb. 1978 28 p refs Presented at 2d World Hydrogen Energy Conf., Zurich, 21-24 Aug. 1978
(Contract EY-76-C-02-0016)
(BNL-24209; Conf-780807-2) Avail: NTIS HC A03/MF A01

Several high temperature two step thermochemical cycles for the production of hydrogen are examined. A thermodynamic analysis of the Fe3O4-FeO, CrCl3-CrCl2, and UCl4-UCl3 pairs reveals the feasibility of the process. A more detailed process analysis is given for the Fe3O4-FeO system using steam as the heat transfer medium for decomposing the higher valent metal oxide for oxygen production, and hydrolyzing the lower oxide for hydrogen production. The steam could be heated to high temperatures by refractory materials absorbing the 14 MeV neutrons in the blanket region of a fusion reactor. Process heat transfer and recovery could be accomplished by regenerative reactors. Proposed operating conditions, the energy balance, and the efficiency of the water decomposition process are presented. With a fusion blanket temperature of 2500 K, thermal efficiencies for hydrogen production of 74.4% may be obtained.
DOE

N79-13188# Los Alamos Scientific Lab., N. Mex. Div. of Basic Energy Sciences.
DECOMPOSITION OF HYDROGEN BROMIDE USING IRON BROMIDE AND MAGNETITE
C. F. V. Mason 1978 19 p refs Presented at 2d World Hydrogen Energy Conf., Zurich, 21-24 Aug. 1978 Submitted for publication
(Contract W-7405-eng-36)

(LA-UR-78-847; Conf-780807-4) Avail: NTIS HC A02/MF A01

A means of thermochemically decomposing hydrogen bromide has been investigated experimentally using the reaction between magnetite and HBr as the bromine producing step. A high yield of Br2 was formed in a short time (90% in 0.5 h). For the hydrogen producing step, the direct hydrolysis of ferrous bromide was confirmed as having an unfavorable equilibrium. However, introduction of magnesium oxide into an aqueous solution of FeBr2 and subsequent heating of the insoluble product gave H2 and Fe3O4 in good yields. Further, Br2 could be regenerated from this Fe3O4 by treatment with HBr. All the reactions were demonstrated to be fast, going to about 85% completion. The main drawback is the heat required to dry and dehydrate magnesium bromide in order to reform MgO by hydrolysis. These reactions are discussed within the framework of a thermochemical cycle. DOE

N79-13189# Department of Energy, Washington, D. C.
COMPARATIVE AUTOMOTIVE ENGINE OPERATION WHEN FUELED WITH ETHANOL AND METHANOL
E. E. Ecklund May 1978 59 p refs Prepared in cooperation with Santa Clara Univ. and Miami Univ., Coral Gables
(Contracts EC-78-C-03-1737; EY-76-S-05-5216)
(HCP/W1737-01) Avail: NTIS HC A04/MF A01

An experimental investigation of Q spark ignition multicylinder engine operation on pure ethanol was undertaken to contrast the engine performance and exhaust emissions with indolene and pure methanol. Equivalence ratio (normalized F/A ratio) was chosen as the principal independent variable. Fuel economy, the regulated exhaust emissions and exhaust aldehydes, and maldistribution were taken as dependent variables. Both steady state engine results and simulated driving cycle (the Federal Emission Test Procedure-FTP and the Highway Fuel Economy Test Procedure-HFETP) results are presented and discussed. The findings show, in general, that ethanol gives results in fuel economy on the basis of miles per millions Btu which lie between the results obtained using gasoline and methanol, i.e., better fuel economy than gasoline and poorer fuel economy than methanol. DOE

N79-13190# Mueller Associates, Inc., Baltimore, Md.
STATUS OF ALCOHOL FUELS UTILIZATION TECHNOLOGY FOR HIGHWAY TRANSPORTATION
Jun. 1978 159 p refs
(Contract EC-77-X-01-2923)
(HCP/M2923-01) Avail: NTIS HC A08/MF A01

The current status of the technology(ies) of alcohol utilization in highway transporation is reviewed. Methanol, ethanol, and certain of their derivatives are treated. The results of engine, vehicle, and fuels testing are summarized. The topics of exhaust emissions, performance, and fuel economy, vehicle drive-ability, fuel systems materials compatibility, engine and vehicle design, fuels characterization, and environmental consideration are discussed in depth, based upon the most recent data available at the time of this writing. The status of the technology at the time of the last comprehensive surveys (1974) is summarized and discussed in greater detail in an appendix to this report. Significant advances made since that time are delineated, as are remaining information gaps and areas in which more extensive investigation is still needed. An appendix is provided which describes the salient properties of selected alcohols and alcohol-derived fuels. DOE

N79-13191# Southwest Research Inst., San Antonio, Tex.
IDENTIFICATION OF PROBABLE AUTOMOTIVE FUELS COMPOSITION: 1985-2000
May 1978 225 p refs
(Contract EY-76-C-04-3684)
(HCP/W3684-01/1) Avail: NTIS HC A10/MF A01

The principal factors and activities in the production of automotive fuels which have synthetic hydrocarbon constituents and alcohol fuels derived from coal are traced and discussed. These include selection of reference raw materials, syncrude compositions for a variety of candidate conversion processes, and finished automotive fuels composition based upon domestic fuel demand projections for the time frame 1985 to 2000. Those fuel-engine relationships pertinent to developing optimized automotive systems are considered in relation to anticipated developments in propulsion systems technology. Projected compositions and performance of finished specification-quality automotive fuels for this time frame are not expected to differ significantly from those for today's fuels since it is anticipated that coal- or shale-derived syncrudes will be blended with dominant petroleum crudes at conventional petroleum refineries rather than at plants dedicated to the exclusive refining of synthetic crudes. DOE

N79-13192# Advisory Group for Aerospace Research and Development, Paris (France).
AIRCRAFT ENGINE FUTURE FUELS AND ENERGY CONSERVATION
Sep. 1978 188 p refs Lecture Series held at Munich, 16-17 Oct. 1978 and London, 19-20 Oct. 1978
(AGARD-LS-96; ISBN-92-835-1297-9) Avail: NTIS HC A09/MF A01

Current and forecasted world energy demands, growth, and supply are reviewed in perspective to the status and outlook for future aviation fuels to meet NATO needs. The special problems associated with the refining of aviation fuels from lower quality feedstocks (including fuel refined from coal, oil shale, and tar sands) and techniques for reducing energy consumption in refining processes are examined. Special attention is given to the chemistry and combustion characteristics of future hydrocarbon fuels and the impact of using these fuels in aircraft engines and fuel systems. An assessment is made as to what technology advancements are currently underway and what other advancements are needed with reference to engine components, engine systems, aircraft designs and operational procedures to help conserve fuel resources. For individual titles, see N79-13193 through N79-13200.

N79-13193# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
FUTURE FUELS FOR AVIATION
J. J. MacFarlane *In* AGARD Aircraft Eng. Future Fuels and Energy Conserv. Sep. 1978 12 p refs (For primary document see N79-13192 04-28)
Avail: NTIS HC A09/MF A01

The historical background of the current aviation gas turbine fuel specification is described. Current local supply difficulties are discussed in relation to crude oil availability and the pattern of regional demand for petroleum products. The consensus of expert opinion on the effects of predicted future petroleum resource availability and of various trade and economic factors on future rates of production are described. Recent data on the demand for petroleum products and the crucial importance of future demand control are discussed. The prospects for petroleum based aviation fuel are evaluated. The long term sources of aviation fuel are described and the problem areas enumerated. The need for a research program on alternative fuels is demonstrated. Previous work using model flames on the effects of fuel composition on rich flame chemistry is reviewed and the potential contribution of fundamental research in the alternative aviation fuels program is outlined. J.M.S.

N79-13194# Shell Research Ltd., Chester (England). Thornton Research Centre.
FUTURE AVIATION FUELS FUEL SUPPLIERS VIEWS
A. Lewis *In* AGARD Aircraft Eng. Future Fuels and Energy Conserv. Sep. 1978 22 p refs (For primary document see N79-13192 04-28)
Avail: NTIS HC A09/MF A01

Developments in the potential future availability of aviation fuels from petroleum crude oils, shale oils, and coal are reviewed on the basis of published data. Much of the data were derived from statistics of the Organization for Economic Cooperation and Development and the Workshop on Alternative Energy Strategies. J.M.S.

N79-13195# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
THE ROLE OF FUNDAMENTAL COMBUSTION IN THE FUTURE AVIATION FUELS PROGRAM
J. J. MacFarlane *In* AGARD Aircraft Eng. Future Fuels and Energy Conserv. Sep. 1978 6 p refs (For primary document

see N79-13192 04-28)
Avail: NTIS HC A09/MF A01

Alternative fuels research using can type engine combustors is briefly summarized. This research stressed the overall response of the system to fairly arbitrary changes in fuel properties and fuel preparation, observing such quantities as carbon deposit formation, wall temperature, combustor outlet temperature distribution, and combustion efficiency. Flame research undertaken to study the way in which carbon is formed in gas turbine primary zones was described. This research utilized experimental model combustors, prevaporized and premixed C5 and C6 hydrocarbons and kerosene, and sprayed kerosene. Contour maps of soot formation as a function of pressure and equivalence ratios were presented. The mechanism of carbon formation in spray flames was discussed. J.M.S.

N79-13196*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHARACTERISTICS AND COMBUSTION OF FUTURE HYDROCARBON FUELS
R. A. Rudey and J. S. Grobman *In* AGARD Aircraft Eng. Future Fuels and Energy Conserv. Sep. 1978 23 p refs (For primary document see N79-13192 04-28)
Avail: NTIS HC A09/MF A01 CSCL 21D

Changes in fuel properties that are expected in future hydrocarbon fuels for aircraft are discussed along with the principal properties of 'syncrudes' and the fuels that can be derived from them. The impact that the resultant potential changes in fuel properties may have on combustion and thermal stability characteristics is illustrated and discussed in terms of ignition, soot formation, carbon deposition, flame radiation, and emissions. J.M.S.

N79-13197*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPACT OF FUTURE FUEL PROPERTIES ON AIRCRAFT ENGINES AND FUEL SYSTEMS
R. A. Rudey and J. S. Grobman *In* AGARD Aircraft Eng. Future Fuels and Energy Conserv. Sep. 1978 29 p refs (For primary document see N79-13192 04-28)
Avail: NTIS HC A09/MF A01 CSCL 21D

The effect of modifications in hydrocarbon jet fuels specifications on engine performance, component durability and maintenance, and aircraft fuel system performance is discussed. Specific topics covered include: specific fuel consumption; ignition at relight limits; exhaust emissions; combustor liner temperatures; carbon deposition; gum formation in fuel nozzles, erosion and corrosion of turbine blades and vanes; deposits in fuel system heat exchangers; and pumpability and flowability of the fuel. Data that evaluate the ability of current technology aircraft to accept fuel specification changes are presented, and selected technological advances that can reduce the severity of the problems are described and discussed. J.M.S.

N79-13198# Pratt and Whitney Aircraft Group, East Hartford, Conn.
ENGINE COMPONENT IMPROVEMENT AND PERFORMANCE RETENTION
William H. Sens *In* AGARD Aircraft Eng. Future Fuels and Energy Conserv. Sep. 1978 12 p (For primary document see N79-13192 04-28)
Avail: NTIS HC A09/MF A01

The importance of improving the fuel consumption of current engines and their derivatives is addressed in terms of making significant savings in aircraft fuel consumption in this century. Methods of reducing fuel consumption of current engines considered include: (1) cycle improvement incorporated in growth and derivative engine models by changes in bypass ratio, overall pressure ratio, and turbine inlet temperature; (2) component performance improvements through design refinements incorporated into the existing engines during routine overhaul; and (3) improved engine performance retention through revised maintenance procedures and improved design. J.M.S.

N79-13199# Pratt and Whitney Aircraft Group, East Hartford, Conn.
LOW ENERGY CONSUMPTION ENGINES
William H. Sens *In* AGARD Aircraft Eng. Future Fuels and Energy Conserv. Sep. 1978 13 p refs (For primary document see N79-13192 04-28)
Avail: NTIS HC A09/MF A01

Improvements in aircraft gas turbine engine economy over four decades are briefly reviewed. Possibilities for the evolution of the turbofan cycle to give improved engine performance are discussed with emphasis on the Energy Efficient Engine Program. Alternative cycles are also considered. These include: Brayton cycle; regenerative cycle; compound; fan; shrouded propeller; and the prop-fan. The prop-fan is considered the most promising. J.M.S.

N79-13200# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ENERGY CONSERVATION AIRCRAFT DESIGN AND OPERATIONAL PROCEDURES **c06**
Philippe Poisson-Quinton *In* AGARD Aircraft Eng. Future Fuels and Energy Conserv. Sep. 1978 47 p refs (For primary document see N79-13192 04-28)
Avail: NTIS HC A09/MF A01

A review is given of studies and applications leading to improved fuel efficiency in the air transportation system. Major technological progress in aerodynamics, structures/materials, propulsion integration, and avionics is quantified for the subsonic transport aircraft as well as future VTOL, STOL, and SST. It is shown that improvements on flight and ground operational procedures are in the developmental stage and that these improvements must strongly reduce the energy waste of the current civil and military air transportation system. J.M.S.

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N79-13201 Vanderbilt Univ., Nashville, Tenn.
STRATEGIES FOR OPTIMAL DESIGN Ph.D. Thesis
Glen Eric Johnson 1978 204 p
Avail: Univ. Microfilms Order No. 7823455

The nonlinear programming approach to mechanical design synthesis is considered with emphasis on strategies to enhance reliability, efficiency and the interaction between the design engineer and the mathematical model. Failure conditions are derived for several popular algorithms. A new algorithm based on a general conjugate direction recursion formula and an acceptable point univariate strategy is constructed and tested using classical test functions and industrial problems. A comparison in terms of equivalent function evaluations and multivariate iterations is made with the quasi-Newton methods. The role of the mathematical model in the solution is then considered. Practical examples are presented in detail and it is shown that a convex formulation with linear constraints may be derived from a nonconvex formulation, with nonlinear constraints.
Dissert. Abstr.

N79-13202# Naval Ship Research and Development Center, Bethesda, Md. Performance Dept.
LIFTING LINE CALCULATIONS FOR HYDROFOIL PERFORMANCE AT ARBITRARY FROUDE NUMBER AND SUBMERGENCE. PART 1: FIXED SHAPE ELLIPTICAL CIRCULATION DISTRIBUTION
Michael B. Wilson Jun. 1978 97 p refs
(zf43421001)
(AD-A058533; DTNSRDC/SPD-0839-01) Avail: NTIS HC A05/MF A01 CSCL 13/10

Hydrofoil drag and lift prediction formulas using the lifting line approximation are evaluated numerically using a computer program developed for the purpose. Some results for selected aspect ratios and foil submergences are displayed in several plots of general interest and usefulness, for the case of an elliptic planform hydrofoil supporting an elliptic circulation distribution of fixed shape, but variable strength. Some preliminary comparisons between results obtained numerically and asymptotic formulas are discussed. These show that for certain extreme cases, the wave drag and the Froude-independent part of the lift correction are well predicted by asymptotic relations. For

intermediate values of both Froude number and submergence ratio, the asymptotic relations give poor results for wave drag. At most all submergences and Froude numbers the existing asymptotic expressions for the Froude-dependent part of lift correction give poor results. GRA

N79-13203# Civil and Environmental Engineering Development Office, Tyndall AFB, Fla. Detachment 1 ADTC.
AN INVESTIGATION INTO THE USE OF POLYMER-CONCRETE FOR RAPID REPAIR OF AIRFIELD PAVEMENTS M.S. Thesis. Final Report, Jun. - Dec. 1977
Michael T. McNerney Jan. 1978 127 p refs
(AF Proj. 2104)
(AD-A059121; CEEDO-TR-78-10) Avail: NTIS HC A07/MF A01 CSCL 01/5

An investigation of a high-strength, fast setting mixture of methyl methacrylate and dry aggregate was conducted. The resulting polymer-concrete (PC) was very strong, durable, and bonded excellently to concrete. Tests were conducted to determine the variables affecting the polymerization time and strength of polymer-concrete. Field tests were conducted to interstate highways and a major airport taxiway which demonstrated the feasibility of making rapid polymer-concrete repairs at a reasonable cost. Laboratory tests of a 3-foot by 6-foot area repaired by PC and an individual PC slab under repeated loadings of simulated truck and aircraft traffic demonstrated the excellent strength and durability of the material. A cost analysis found the cost of monomer to be approximately $10/cubic foot for most repairs. Author (GRA)

N79-13204# Los Alamos Scientific Lab., N. Mex.
MAGNETIC REFRIGERATOR DEVELOPMENT Progress Report, 1 Dec. 1977 - 28 Feb. 1978
Barclay J. A., comp. and W. A. Steyert, comp. Jun. 1978 14 p refs
(Contract W-7405-eng-36)
(LA-7257-PR) Avail: NTIS HC A02/MF A01

The development of new, low cost, high efficiency, magnetic refrigeration methods for cooling large superconducting devices of interest to the electric power industry are the objectives of this program. Tests of the magnetic materials, gadolinium, and fluid flow through it are essentially complete. The parts for the superconducting magnet and Dewar are complete. Construction of the refrigerator wheel is expected to begin in April 1978. DOE

N79-13205# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
USE OF DREDGINGS FOR LANDFILL: SUMMARY TECHNICAL REPORT Final Report
Raymond J. Krizek and Max W. Giger May 1978 102 p refs
(Grant EPA-R-800948)
(PB-284261/5; EPA-600/2-78/088A) Avail: NTIS HC A06/MF A01 CSCL 13B

The usefulness of dredged sediments as landfill material is evaluated. The study is limited to the deposition of polluted fresh water dredgings from the Great Lakes area, and the major effort was centered around four disposal sites in the harbor serving Toledo, Ohio. A comprehensive sampling and testing program was undertaken in the field and in the laboratory to determine the engineering characteristics of hydraulically placed maintenance dredgings and the water quality effects associated with a typical dredging and disposal operation. Several thousand chemical analyses were conducted to assess the pollution potential of dredged materials under chemically treated and nontreated conditions. GRA

N79-13206# National Bureau of Standards, Washington, D. C.
REPORT OF THE NATIONAL CONFERENCE ON WEIGHTS AND MEASURES, 62D Final Report
Aug. 1978 306 p refs Conf. held at Dallas, Tex., 17-22 Jul. 1977
(PB-285112/9; NBS-SP-517; LC-26-27766) Avail: NTIS HC A14/MF A01 CSCL 14B

The proceedings (edited) of the 62nd National Conference on Weights and Measures attended by state, county, and city weights and measures officials, the Federal Government, business, industry, and consumer organizations are presented. Major issues discussed at this Conference included: metric conversion in the United States; problems relating to the quantity fill, labeling, and inspection of packaged commodities; requirements covering the design and performance of new weighing and measuring technology; and recommendations for improvement in weights and measures administration. GRA

N79-13207# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
HELIUM HEAT TRANSFER AND REFRIGERATION IN SUPPORT OF MAGNETIC FUSION ENERGY SYSTEMS
V. Arp, J. A. Brennan, P. J. Giarratano, W. R. Parrish, and W. G. Steward Feb. 1978 140 p
(PB-285231/7; NBSIR-78-877) Avail: NTIS HC A07/MF A01 CSCL 18A

The report is divided into four parts: (1) an assessment of the cryogenic engineering data base used in the MFE community, and recommendations for needed work for that base, (2) experimental progress on measurement of transient helium heat transfer; the data are of importance for magnet stability analysis, (3) presentation of a newly developed general technique for analyzing the efficiency of helium refrigerators of any configuration and thereby identifying sources of inefficiency, and (4) progress towards setting up a data bank on refrigeration system reliability. The technology assessment, item (1), is a revision of a preliminary version dated May 13, 1977, with inclusion of feedback received from both within and outside the MFE community. GRA

N79-13208# California Univ., Richmond. Earthquake Engineering Research Center.
THE DEVELOPMENT OF ENERGY-ABSORBING DEVICES FOR ASEISMIC BASE ISOLATION SYSTEMS
James M. Kelly and D. F. Tsztoo Jan. 1978 54 p refs
(Grant NSF ENV-76-04262-A02)
(PB-284978/4; UCB/EERC-78/01; NSF/RA-780190) Avail: NTIS HC A04/MF A01 CSCL 13M

The behavior of mild steel energy-absorbing devices is considered for earthquake isolation systems. The devices are rigid under service-type loading, but yield and absorb energy under large earthquake-type loading. The devices were shown to have substantial hysteretic energy absorbing capacity over a useful life in excess of 300 cycles, far exceeding any load duration which can be expected from earthquake loadings. The hystersis loops developed by sinusoidal loading of the devices effectively bounded the loops obtained by the random loading of the devices. GRA

N79-13209# National Bureau of Standards, Washington, D. C. Center for Building Technology.
METRICATION IN BUILDING DESIGN, PRODUCTION, AND CONSTRUCTION: A COMPENDIUM OF 10 PAPERS Final Report
Hans J. Milton Sep. 1978 199 p
(PB-285534/4; NBS-SP-530; LC-78-600086) Avail: NTIS HC A09/MF A01 CSCL 13M

Some of the subject areas addressed are: management and economics of metrication; specific product metrication; public construction sector role in metrication; building standards and codes in metrication; graphic design in metrication; and United States' opportunities in metrication. A subject index has been included for ready reference to specific metric topics. GRA

N79-13210# Federal Highway Administration, Washington, D.C.
PREDICTIVE DESIGN PROCEDURES, VESYS USERS MANUAL: AN INTERIM DESIGN METHOD FOR FLEXIBLE PAVEMENTS USING THE VESYS STRUCTURAL SUBSYSTEM Final Report
William J. Kenis Jan. 1978 137 p refs
(PB-285488/3; FHWA/RD-77-154) Avail: NTIS HC A07/MF A01 CSCL 13B

This manual was written to provide the pavement manager and design engineer with a ready reference of procedures to predict the structural responses and hence the integrity of flexible pavements. A pavement section of known geometry is chosen, and its behavior over time is predicted by sets of mechanistic models which have been computer programmed. The computer

program package known as the VESYS System computes pavement, response, distress, and serviceability. GRA

N79-13211# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Civil Engineering.
SKID RESISTANT CHARACTERISTICS OF ILLINOIS AGGREGATES Final Report
Richard L. Berger, Suzanne J. Russell, Charles R. Marek, Peter J. Tarkoy, and C. R. Ullrich 18 May 1978 148 p Sponsored in part by Federal Highway Admin. and Illinois State Dept. of Transportation
(PB-285241/6; Transportation-Engr-Ser-23; UILU-ENG-78-2005; FHWA/IL-78-UI-170) Avail: NTIS HC A07/MF A01 CSCL 13B

Laboratory tests were conducted on aggregate and rock samples from quarries which had provided aggregate for test pavements. Aggregate extracted from bituminous cores were also tested. The tests included the determination of acid insoluble residue content, Na2SO4 soundness, LA abrasion resistance, abrasion hardness, rebound hardness, accelerated wear, and petrographic characteristics. These data were correlated with the skid resistance of PCC and bituminous pavements measured by the braking trailer skid tests, British pendulum tester and the evaluation of textural parameters from stereophotographs. The study concentrated on relating coarse aggregate characteristics to skid resistance of bituminous pavements. GRA

N79-13212# New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.
MEASURING SURFACE TEXTURE OF CONCRETE PAVEMENTS BY THE SAND-PATCH METHOD Interim Report
William P. Chamberlin and Duane E. Amsler Jul. 1978 24 p refs Sponsored in part by DoT
(PB-284949/5; RR-78-62; FHWA/NY-78-RR-62; IR-4) Avail: NTIS HC A02/MF A01 CSCL 13B

The components of variance were analyzed for 720 measures of concrete pavement texture depth obtained by the sand-patch method. The measurements were made in connection with a complete factorial field experiment involving four texturing methods on two sections each of five different paving jobs. Each pavement section was tested at three different sites by three different operators performing two tests each. The analysis permitted estimates of the repeatability and reproducibility of the sand-patch test, as well as errors that can be expected in measuring the mean texture depths of a section of textured pavement. GRA

N79-13213*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A SURVEY OF ELECTRIC AND HYBRID VEHICLES SIMULATION PROGRAMS. VOLUME 2: QUESTIONNAIRE RESPONSES
J. Bevan, D. A. Heimburger, and M. A. Metcalfe 1 Jul. 1978 284 p refs
(NASA-CR-157845; JPL-Publ-78-58-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 13F

The data received in a survey conducted within the United States to determine the extent of development and capabilities of automotive performance simulation programs suitable for electric and hybrid vehicle studies are presented. The survey was conducted for the Department of Energy by NASA's Jet Propulsion Laboratory. Volume 1 of this report summarizes and discusses the results contained in Volume 2. G.Y.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N79-13214* National Aeronautics and Space Administration. Pasadena Office, Calif.
CONICAL SCAN TRACKING SYSTEM EMPLOYING A LARGE ANTENNA Patent
John E. Ohlson (JPL) and MacGregor S. Reid, inventors (to NASA) (JPL) Issued 24 Oct. 1978 6 p Filed 25 Jul. 1977 Supersedes N77-28357 (15 - 19, p 2520) Sponsored by NASA
(NASA-Case-NPO-14009-1; US-Patent-4,122,454; US-Patent-Appl-SN-818917; US-Patent-Class-343-117R; US-Patent-Class-343-7.4; US-Patent-Class-343-118) Avail: US Patent and Trademark Office CSCL 17B

A conical scan tracking system for tracking spacecraft and distant radio sources is described. The system detects small sinusoidal modulation in received power from a source that is off target with a frequency equal to a very low scan rate, an amplitude proportional to angular deviation of the source from the target, and a phase directly related to the direction the source is off target. The sinusoid is digitally correlated with inphase and out-of-phase scan sinusoids to obtain azimuth/elevation and hour angle/declination signals which are digitally integrated over exactly one scan period to obtain correction signals for an antenna pointing subsystem.
Official Gazette of U.S. Patent and Trademark Office

N79-13215 Stanford Univ., Calif.
A PULSE-POWERED MICROPOWER MONOLITHIC COMMAND RECEIVER Ph.D. Thesis
Robert Claude Pettengill, Jr. 1978 113 p
Avail: Univ. Microfilms Order No. 7822559

A pulse-powered command receiver was developed that achieves a unique combination of long range, small size, and low power consumption. The command receiver functions as a radio-controlled power switch for biomedical implants in animal subjects. A lateral pnp biasing technique efficiently realizes the digital circuits required for the pulsed receiver on an array of linear monolithic components called the Kitchip. This array enabled the development of a low-cost monolithic command receiver that achieves a range of 30 m and draws less than 60 microns W of power. This receiver demonstates the viability of pulse powering as a power-reduction technique for sampled-data analog systems. Dissert. Abstr.

N79-13216 Arizona Univ., Tucson.
EXTERIOR-INTERIOR APERTURE COUPLING OF A RECTANGULAR CAVITY WITH WIRE OBSTACLE Ph.D. Thesis
William Arthur Johnson 1978 99 p
Avail: Univ. Microfilms Order No. 7824367

For numerical considerations the obstacle is taken to be a straight, thin wire, oriented perpendicular to one of the cavity walls. The problem is formulated in the frequency domain. The dyadic formulation of this vector electromagnetic boundary value problem is given. The controversy over the longitudinal wave functions and their contribution to field dyads is resolved. Specific attention is given to the singularities and completeness of the Green's dyads' eigenfunction expansions. Numerically tractable integral equations for the aperture electric fields are obtained. A summation method is developed for evaluation of otherwise slowly converging eigenfunction expansions of potential dyads when source and observation points become close. Dissert. Abstr.

N79-13217 Mississippi State Univ., State College.
ON THE DEVELOPMENT OF NUMERICAL TECHNIQUES FOR TREATING ARBITRARILY-SHAPED SURFACES Ph.D. Thesis
Allen Wilburn Glisson, Jr. 1978 316 p
Avail: Univ. Microfilms Order No. 7824045

The treatment of electromagnetic radiation and scattering from arbitrarily-shaped surfaces by the method of moments is reported. An infinite strip with a sharp bend subject to illumination by both TE and TM plane waves is considered. The effects of edges, bends, and changes in subdomain size on numerical solutions are discussed. The problem of a rectangular bent plate is also studied and procedures are developed which allow a wire to be attached to the planar surface or on the bend. Structures which are classified as bodies of revolution are next considered, where the bodies may be either dielectric or perfectly conducting. Numerical solutions obtained for the body of revolution are compared with other available data and it is noted that stability problems which have been encountered by some other researchers do not appear to be present in the techniques described in this work. The capabilities of these methods are further demonstrated by an investigation of the stepped-radius antenna. Numerical solutions for the variation of the current and charge in the vicinity

of the junction are found to agree with theoretical predictions based on edge conditions. Dissert. Abstr.

N79-13218 Missouri Univ. -Rolla.
TWO-DIMENSIONAL MULTIPLY SCATTERING IN A CYLINDRICAL MEDIUM Ph.D. Thesis
Ronald Lance Dougherty 1978 335 p
Avail: Univ. Microfilms Order No. 7822378

Equations are developed for the source function, flux, and intensity in a two-dimensional, cylindrical medium which is radially infinite in extent and scatters isotropically or anisotropically. Cylindrical geometry is appropriate because the incident radiation is collimated, normal to the surface of the medium, and depends only on the radial coordinate. Two boundary conditions are investigated. The first is a Bessel function in the radial coordinate, and the second is a Gaussian distribution which closely approximates the shape of a laser beam. It is shown that the solution to any problem which has a Hankel transformable boundary condition (e.g., the Gaussian beam) can be constructed from the Bessel-varying results. Tabular and graphical information is presented at both boundaries of the medium for the two boundary conditions. A method is proposed for extending these results to the problem of a strongly spiked phase function for scattering which can be modeled by a Dirac delta function. Dissert. Abstr.

N79-13219 Princeton Univ., N. J.
SIGNAL DETECTION IN CORRELATED NOISE Ph.D. Thesis
Michael Dwain Wood 1978 202 p
Avail: Univ. Microfilms Order No. 7823537

A general technique for approximating the impulse response of a (correlated noise) matched filter is proposed. The impulse response of the approximating filter consists of a weighted sum of delayed replicas of the signal. The weights are chosen so as to maximize the output signal-to-noise ratio (SNR) of the resulting filter and are obtained as the solution to a simple matrix equation. Because this matrix equation is of smaller dimension than the matched filter equation, the design of this alternative filter requires significantly less computation than the matched filter. Several other approximating filters are also considered. In addition, the sensitivity of one of the approximating filters with respect to changes in either the signal or the noise autocorrelation matrix is examined and compared to the sensitivity of the matched filter. Dissert. Abstr.

N79-13220 Georgia Inst. of Tech., Atlanta.
OPTIMUM PROBES FOR NEAR-FIELD ANTENNA MEASUREMENTS ON A PLANE Ph.D. Thesis
Gene Keith Huddleston 1978 251 p
Avail: Univ. Microfilms Order No. 723710

An optimum probe criterion is defined by using the properties of the prolate spheroidal wave functions as they relate to the uncertainty principle and Fourier transform theory. It is shown that an optimum rectangular horn probe exists for the near-field measurement on a linearly polarized test antenna, and that its use produces the most accurate far-field predictions. A computer-aided procedure for the design of the optimum probe is described. It is found that the probe having the most directive far-field patter produces the most concentrated near-field response, the most accurate measured spectra, and the most accurate far-field patter predictions. Dissert. Abstr.

N79-13221 Stanford Univ., Calif.
VLF WAVE-WAVE INTERACTION EXPERIMENTS IN THE MAGNETOSPHERE Ph.D. Thesis
Donald Chin-Dong Chang 1978 216 p
Avail: Univ. Microfilms Order No. 7822486

VLF wave-wave interaction experiments were carried out by injecting various forms of VLF pulses into the magnetosphere from a 21.2 Km dipole antenna at Siple, Antarctica. This report is divided into three parts. In the first part, simulations of VLF pulses propagating in the magnetosphere are carried out. The results show that the leading edge of a VLF pulse is distorted sufficiently when it arrives at the interaction region to alter the details of the wave-particle interaction process in the magnetosphere. In the second part, it is found for the first time that a 10 ms gap in a triggering wave can induce emission, which may then interact with the post-gap signals. In the third part, sideband triggering is reported for the first time. Sidebands are generated by frequency-shift-key modulation techniques. Dissert. Abstr.

N79-13222 Yale Univ., New Haven, Conn.
ESTIMATION OF TRAJECTORY PARAMETERS FROM PASSIVE ARRAY MEASUREMENTS Ph.D. Thesis
Ehud Weinstein 1978 279 p
Avail: Univ. Microfilms Order No. 7820813

Passively locating a source of radiation by an array of sensors is studied. The source is moving along some unknown trajectory radiating a signal which is characterized as a sample function from a Gaussian random process. A time-delay version of the radiated signal plus additive noise are observed at several sensor outputs. All the information about source location and track is contained in the relative delay of the radiated signal to the various sensors. A method was found to reduce the problem to a stationary one by introducing a transformation which does not affect the performance of the optimal estimator. It is then possible to evaluate the error covariance matrix for the joint estimate of an arbitrary number of delay parameters. Dissert. Abstr.

N79-13223 Ohio State Univ., Columbus.
GAIN DEGRADATION AND AMPLITUDE SCINTILLATION DUE TO TROPOSPHERIC TURBULENCE Ph.D. Thesis
David McClead Theobold 1978 65 p
Avail: Univ. Microfilms Order No. 7819675

Mean signal levels well below those predicted by standard techniques on low elevation earth-space microwave links were observed and reported previously. Additionally, amplitude fluctuations under clear air conditions accompany these reduced signal levels and increase significantly as elevation angle decreases. It is shown that a simple physical model is adequate for the prediction of the long term statistics of both the reduced signal levels and increased peak-to-peak fluctuations. The model is based on conventional atmospheric turbulence theory and incorporates both amplitude and angle of arrival fluctuations. Dissert. Abstr.

N79-13224*# Stanford Univ., Calif. Radioscience Lab.
VLF WAVE-WAVE INTERACTION EXPERIMENTS IN THE MAGNETOSPHERE
Donald C. D. Chang May 1978 210 p refs
(Grants NGL-05-020-008; NSF DPP-76-82646; NSF ATM-75-07707)
(NASA-CR-157954; SU-SEL-78-017; SU-TR-3458-1) Avail: NTIS HC A10/MF A01 CSCL 20N

VLF wave-wave interaction experiments were carried out by injecting various forms of VLF pulses into the magnetosphere from a 21.2 km dipole antenna at Siple, Antarctica. The injected signals propagate along a geomagnetic field line and often interact strongly with energetic electrons trapped in the radiation belts near the equator. Signals may be amplified and trigger emissions. These signals may then interact with one another through these energetic electrons. This report is divided into three parts. In the first part, simulations of VLF pulses propagating in the magnetosphere are carried out. In the second part, it is found for the first time that a 10 ms gap in a triggering wave can induce emission, which may then interact with the post-gap signals. In the third part, sideband triggering is reported for the first time. G.Y.

N79-13225*# National Aeronautics and Space Administration, Washington, D. C.
DETERMINATION OF THE TIME DELAY IN THE CASE OF TWO-PATH PROPAGATION ON THE BASIS OF THE ATTENUATION CHARACTERISTICS FOR TWO ADJACENT FREQUENCIES
H. G. Gilroi Jan. 1979 9 p refs Transl. into ENGLISH from Kleinheubacher Ber. (East Ger.) v. 19, 1976 p 261-265 Original language document was announced as A76-32073
(NASA-TM-75378) Avail: NTIS HC A02/MF A01 CSCL 20N

Pronounced fading occurring in the line of sight radio links at frequencies below 10 GHz can be traced to the effects of multipath propagation. Modulation disturbances depend on travel time differences between the direct wave and the wave which is reflected at atmospheric layers. A method described for the

determination of the time delay is based on an indirect approach which utilizes the difference in fading at various frequencies. The method was employed in measurements involving a distance of 181 km. The results obtained in the measurement are discussed. Author

N79-13226# Mitre Corp., Bedford, Mass.
SEEK IGLOO LIFE CYCLE COST MODEL VOLUME 3: MAINTENANCE MANUAL
J. K. Ferraiolo Jul. 1978 157 p
(Contract F19628-78-C-0001)
(AD-A058632; MTR-3577-Vol-3; ESD-TR-79-155-Vol-3) Avail: NTIS HC A08/MF A01 CSCL 09/2

An interactive Life Cycle Cost (LCC) mathematical model with a built-in sensitivity analysis capability has been developed for use in the evaluation of proposed designs for the Air Force SEEK IGLOO Radar System. This Maintenance Manual provides the information necessary to maintain, or possibly modify, the FORTRAN code of the LCC Model. It contains a complete discussion of the structure, conventions, subroutines, etc., of the LCC Model computer program. A complete listing of the FORTRAN code of the LCC Model, which contains extensive internal comments, is included in the Maintenance Manual.
Author (GRA)

N79-13227# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
ON THE DEVELOPMENT OF SPACE OBJECT OPTICAL AND LWIR CROSS SECTION POPULATION DISTRIBUTIONS FROM UHF CROSS SECTIONS Final Technical Report, Jul. 1972 - Jun. 1974
Kenneth E. Kissell, Eugene Muschell, and Richard C. Vanderburgh Dec. 1977 28 p refs
(AF Proj. 7660)
(AD-A058709; AFAL-TR-77-193) Avail: NTIS HC A03/MF A01 CSCL 17/8

The resident population of artificial satellites is ever-changing, with new spacecraft and debris being orbited almost daily and older space objects decaying or commanded to earth. Decisions about deployment of future surveillance systems, in most cases requiring 5-10 years of development work before being placed in operation, must be based on a projection of the workload and target detectability which will exist in the future. This report extends to optical detection a rationale used by ADCOM to develop a future radar population. Using this radar population and empirical relationships between optical and UHF radar cross sections in the 1973 satellite population, it predicts the mean optical scattering of sunlight to be 45% of the UHF radar scattering. An analytical model is used to approximate the long-wavelength infrared (LWIR) target brightness in more-complex analogy to radar cross section. This results in a prediction that the mean LWIR cross section will be some 55% greater than the UHF radar cross section but with an uncertainty of a factor 4 in the cross section, i.e., the mean LWIR cross section should lie between 0.4X to 6.2X the UHF cross section depending on the surface materials of the spacecraft. Author (GRA)

N79-13228# Naval Research Lab., Washington, D. C. Target Characteristics Branch.
PERFORMANCE OF AN ANTENNA SHARING THE APERTURE OF A FREQUENCY-SCANNED ARRAY Final Report
Russell M. Brown 12 May 1978 23 p refs
(SF12141491)
(AD-A058600; AD-E000194; NRL-8226) Avail: NTIS HC A02/MF A01 CSCL 09/5

The normally terminated ports of the directional couplers in a frequency-scanned array can be driven to obtain an auxiliary beam from the antenna without affecting the frequency-scanned pattern. Any interaction between the two beams will appear either as changes in the pattern of the auxiliary beam or in an excess of power dumped into the load terminating the sinuous feed. In this report an antenna with a cosecant-squared auxiliary beam is analyzed to show these effects. Author (GRA)

N79-13229# Naval Surface Weapons Center, White Oak, Md.
PERFORMANCE OF POLYMER WAVEGUIDE AT MILLIMETER WAVELENGTHS Final Report
D. G. Jablonski, A. M. Syeles, A. D. Krall, and O. J. Vansanti May 1978 79 p refs
(AD-A058784; NSWC/WOL/TR-77-115) Avail: NTIS HC A05/MF A01 CSCL 09/5

Investigation and measurements are made at 70 GHz on dielectric waveguide operating in the HE11 mode. Loss characteristics radiation, power handling and field characteristics are discussed. Author (GRA)

N79-13230# Illinois Univ., Urbana-Champaign. Dept. of Electrical Engineering.
PENETRATION OF AN EM WAVE INTO A CYLINDRICAL CAVITY AND THE CURRENT INDUCED ON A WIRE INSIDE
E. K. Yung, S. W. Lee, and R. Mittra Aug. 1978 49 p refs
(Contract N00014-75-C-0293)
(AD-A058769; EM-78-9; UILU-ENG-78-2551) Avail: NTIS HC A03/MF A01 CSCL 20/14

This paper addresses the problem of computing the current induced in a thin wire located inside a cylindrical cavity with a circumferential slot when the cavity is illuminated by an incident plane wave. The calculation is carried out in two steps. First, the problem of penetration of the incident field into the cavity is solved by the method of moments under the assumption that the presence of the wire inside the cavity creates little or no perturbation of the interior field. Next, the induced current on the wire is calculated by the following two methods: use of a simple analytical formula derived from the application of the Wiener-Hopf techniques to the finite wire problem; and numerical solution of an integral equation. Extensive numerical results for the induced current are presented. It is found that the current is sensitive to the cylinder radius, the cavity height, the frequency of excitation, and the wire location, but is relatively less sensitive to the variation in the slot length. In addition, the induced current on a wire inside the cavity can be much larger than its counterpart in free space illuminated by the same incident plane wave at frequencies where the cavity is near resonance. Author (GRA)

N79-13231# CNR, Inc., Needham, Mass.
SYSTEM TIMING AND SYNCHRONIZATION Final Technical Report, Jul. 1976 - Jan. 1978
Peter Alexander, James W. Graham, and David J. Miller Griffiss AFB, New York RADC Jul. 1978 370 p
(Contract F30602-76-C-0347; AF Proj. 2157)
(AD-A058468; RADC-TR-78-166) Avail: NTIS HC A16/MF A01 CSCL 17/2

In the planned DCS digital network, the ability to coordinate clocks placed at geographically separated nodes will be of critical importance. Aside from the characteristics of the clocks themselves, medium and link equipment parameters play dominant roles in determining performance for the system. The emphasis in this report is on troposcatter and line of sight link parameters and their relationship to network clock synchronization. This report includes analysis and discussion of the important physical effects in troposcatter propagation, and a description of experiments and data acquired during a recent measurement program designed to establish a better understanding of the relevant troposcatter and line of sight medium and equipment effects. Author (GRA)

N79-13232# Rome Air Development Center, Griffiss AFB, N.Y.
DESIGN FACTORS IN THE TUNED SYNTHETIC APERTURE RADAR
Richard A. Luhrs and John K. Schindler Aug. 1977 31 p refs
(AF Proj. 2305)
(AD-A058780; RADC-TR-77-289) Avail: NTIS HC A03/MF A01 CSCL 17/9

The frequency filters are implemented by applying the discrete Fourier transform to the returning radar pulses. Proper selection of the particular outputs at which a target appears at a given time is the function of a computer program, for which the theoretical foundations and program logic are developed in the report. The program can be used to determine the specific factors to be programmed for processing return data and for designing the actual processor. The results show typical memory and time requirements for laboratory test-bed and operational processors. Finally, a technique for reducing total memory required by reducing stored input data is described and developed.

Tradeoffs between time and memory are discussed, and optimal operating point calculations are developed. GRA

N79-13233# Naval Surface Weapons Center, White Oak, Md.
IN-HOUSE EXPLORATORY DEVELOPMENT PROGRAM ON MICROSTRIP ANTENNAS Final Report
J. N. McCorkle and L. M. Black 28 Feb. 1978 63 p refs
(ZF61112001)
(AD-A058899; NSWC/WOL/TR-76-69) Avail: NTIS HC A04/MF A01 CSCL 09/5

This report describes some of the basic forms of the microstrip patch antenna and gives a general theory of operation. It then goes into the derivation of a previously unpublished design procedure for the rectangular patch radiator. The computer aided design procedure is explained in detail. Author (GRA)

N79-13234# Environmental Research and Technology, Inc., Concord, Mass.
OPERATIONAL ALGORITHMS FOR THE ESTIMATION OF CLEAR SKY EMISSION VALUES Final Report, Mar. 1977 - Feb. 1978
M. G. Fowler and N. K. Tripp Jul. 1978 74 p
(Contract F19628-77-C-0119)
(AD-A059227; ERT-P-2654F; RADC-TR-78-168) Avail: NTIS HC A04/MF A01 CSCL 12/1

Operational algorithms were developed to estimate clear sky emission values at 35 GHz from cloudy emission values measured at 18, 22.235 and 35 GHz. These algorithms are designed for use with sidelooking radiometers located at Hanscom AFB, MA and Eglin AFB, FL. Unique constants were developed for each season and locale and are presented in the appendix with constants developed to invert for integrated liquid water and water vapor along the atmospheric path sensed by the radiometer. Author (GRA)

N79-13235# Defence Research Establishment, Ottawa. (Ontario). Defence Electronics Section.
TRACKER ANTENNA LOCATION STUDY
J. Glen Rumbold Jul. 1978 117 p refs
(AD-A059026; DREO-TN-78-4) Avail: NTIS HC A06/MF A01 CSCL 17/9

This report details the antenna location study for the Tracker Aircraft refitment. Computer prediction of electromagnetic interference and antenna coupling in conjunction with antenna pattern measurements made on a scale model of the Tracker yielded suggested locations for the new antennas. Author (GRA)

N79-13236# Rome Air Development Center, Griffiss AFB, N.Y.
ON REDUCING THE FIELD STRENGTH IN THE FRESNEL ZONE OF AN ANTENNA Interim Report
Ronald L. Fante May 1978 23 p refs
(AF Proj. 2305)
(AD-A059225; RADC-TR-78-130) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report has studied the possibility of reducing the mean squared field strength over some region in the Fresnel zone of an antenna without significantly distorting its radiation pattern. For a high-gain antenna it has been found that there is significant radiation pattern distortion if attempts are made to reduce the mean squared Fresnel field, over a region several or more wavelengths in extent, by more than about a factor of 2. GRA

N79-13237# Princeton Univ., N. J. Information Sciences and Systems Lab.
ADAPTIVE DETECTION OF RENEWAL PROCESSES Technical Report, Oct. 1977 - May 1978
A. Fogel and S. C. Schwartz Sep. 1978 44 p refs
(Contract N00014-77-C-0644; Grant NSF ENG-75-09610)
(AD-A058815; TR-1) Avail: NTIS HC A03/MF A01 CSCL 09/3

This report considers the adaptive detection of renewal processes whose inter-arrival times are Gamma distributed. It is shown that the optimum detector exhibits a two-dimensional estimator-correlator structure for the two pertinent parameters. When the underlying statistics are partially known, the estimates appearing in the receiver cannot be implemented. Three suboptimum schemes with surprisingly good small sample performance are derived and compared. GRA

N79-13238# South Dakota School of Mines and Technology, Rapid City. Dept. of Electrical Engineering.
SAPPHIRE ATOMIC HYDROGEN DISSOCIATOR BULB DESIGN Final Report
Carl L. Gruber May 1978 32 p refs
(Contract N00173-77-C-0134)
(AD-A058812) Avail: NTIS HC A03/MF A01 CSCL 07/4

Design criteria and fabrication details of a 2-inch diameter by 2 inch high circular cylinder hydrogen RF discharge dissociator bulb are developed and described. A rate equation model is developed to determine operating parameter relationship to be investigated during the testing program phase to follow. Results from testing of a similar pyrex dissociator bulb are presented. Author (GRA)

N79-13239# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
ELECTRICALLY SMALL LOOP ANTENNA LOADED BY A HOMOGENEOUS AND ISOTROPIC FERRITE CYLINDER, PART 2 Interim Report
D. V. Giri and R. W. P. King Jul. 1978 124 p refs
(Contracts N00014-75-C-0648; N00014-67-A-0298-0005)
(AD-A058827; TR-668) Avail: NTIS HC A06/MF A01 CSCL 09/5

Two theoretical approaches are developed to determine the magnetic current distribution on a ferrite cylinder of finite length that is center-driven by an electrically small loop antenna carrying a constant current. The first method makes use of the analogy between the ferrite rod antenna and the conducting cylindrical dipole antenna to derive an integral equation for the magnetic current on an infinitely permeable (mu sub r = infinity) ferrite antenna that corresponds to the integral equation for the electric current on a perfectly conducting electric dipole antenna. In the limit h approaches infinity, this integral equation is shown to agree with that obtained previously in Part I for the infinite ferrite rod antenna. Continuing to parallel the treatment of the electric dipole antenna, the integral equation is modified by the introduction of an internal impedance per unit length of the magnetic conductor to account for values of mu sub r that are large but not infinite, and finally an approximate, three-term expression is derived for the current on an 'imperfectly conducting' magnetic conductor. The second, more rigorous theoretical approach obtains two coupled integral equations in terms of the tangential electric field and the tangential electric surface current from independent treatments of the interior (ferrite) and exterior (free space) problems. The coupled equations are then solved numerically by means of the moment method. Finally the results of the two theories are compared with experimental measurements made on eleven different antenna configurations. The agreement is good. Author (GRA)

N79-13240# Illinois Univ. at Urbana-Champaign, Urbana. Coordinated Science Lab.
ACCURACY TESTS FOR ASYMPTOTIC SOLUTIONS TO RADIATION FROM A CYLINDER
M. Tew and R. Mittra Dec. 1977 61 p refs
(Contracts DAAB07-72-C-0259; N00019-77-C-9127)
(AD-A058493; R-804) Avail: NTIS HC A04/MF A01 CSCL 20/3

The problem of determining the induced surface currents on an infinite circular cylinder excited by a slot radiator has received increased attention in recent years. One reason for this interest is the usefulness of the induced currents in calculating various electrical parameters. In a conformal slot array, for instance, knowledge of the currents allows calculation of both the mutual impedance between two slots and the far-field pattern. The work reported here is concerned with tests which attempt to evaluate the accuracy of existing solutions for the infinite cylinder problem. Author (GRA)

N79-13241# Ohio State Univ., Columbus. Electroscience Lab.
A HYBRID TECHNIQUE FOR COMBINING THE MOMENT METHOD TREATMENT OF WIRE ANTENNAS WITH THE GTD FOR CURVED SURFACES
Ernest P. Ekelman, Jr. and Gary A. Thiele Jul. 1978 132 p refs
(Contract N00014-76-C-0573)

(AD-A058495; ESL-784372-5) Avail: NTIS HC A07/MF A01 CSCL 09/5

The hybrid technique presented in this paper is a method for solving electromagnetic problems in which an antenna or other discontinuity is located on or near a conducting body, such as antennas on ships or aircraft. The technique solves these kinds of problems by properly analyzing the interaction between the antenna or scatterer and the conducting body. The hybrid technique accomplishes this by casting the antenna structure in a moment method format then modifying that format to account for the effects of the conducting body via the geometrical theory of diffraction. The technique extends the moment method to handle many problems that cannot be solved by GTD or the moment method alone. In general, arbitrary radiators located on or near canonical shapes or combinations thereof can be solved using the hybrid technique. Electromagnetic parameters for which the hybrid technique can solve include the near and far fields, current distributions, impedances, and scattering data. In this paper, wire antennas are analyzed to find their input impedance when they are located near perfectly-conducting circular cylinders. The purpose of this paper is to present the technique and demonstrate some of its facility and its accuracy. GRA

N79-13242# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

AN INVESTIGATION OF RADAR RETURNS AND THEIR RELATIONSHIP TO SEVERE WEATHER OCCURRENCES M.S. Thesis - St. Louis Univ.

Werner Helmut Balsterholt 1978 99 p refs

(AD-A058401; AFIT-CI-78-64) Avail: NTIS HC A05/MF A01 CSCL 17/9

One of the primary responsibilities of the operational meteorologist is to issue warning for possible occurrences of severe weather. These warnings allow the meteorological customer and the public, time to take precautionary measures, either in terms of a reduction of property loss or savings in human suffering. To do this job effectively, the meteorologist relies heavily on weather radar to detect, identify, and track convective storms. Conventional radar does not detect or identify severe weather associated with convective activity, but rather its presence is inferred based on the meteorologist's interpretation of radar backscatter information. Doppler radar has been shown to be a better tool than conventional radar for severe storm identification, but Doppler radar is not operationally deployed for thunderstorm surveillance. Until Doppler radar becomes operationally available to the practicing meteorologist, conventional radar must be used to identify those storms capable of producing severe weather at the surface. GRA

N79-13243# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Technology Lab.

EXACT PROBABILITY DENSITY FUNCTION OF THE MONOPULSE RATIO

Irving Kanter and Robert R. Boothe Feb. 1978 22 p refs

(AD-A058459; RDMI-T-78-44) Avail: NTIS HC A02/MF A01 CSCL 17/9

It has been shown that unless there is only a single on-axis target, the angle estimator (monopulse ratio) at the output of a monopulse radar is biased. No matter how large the signal-to-noise ratio, the variance of the estimate is unbounded. A measure of the spread of the probability density function has been introduced and a procedure developed to calculate the spread from the exact closed form expression for the probability density function of the monopulse ratio. The bias is also available by numerically calculating the mean of the probability density function.

Author (GRA)

N79-13244# Illinois Univ. at Urbana-Champaign, Urbana. Coordinated Science Lab.

SIGNAL-TO-NOISE RATIO ANALYSIS OF TWO IMPLEMENTATIONS OF QUADRIPHASE DIRECT-SEQUENCE SPREAD-SPECTRUM MULTIPLE-ACCESS M.S. Thesis

Frederick Dwight Garber May 1978 62 p refs

(Contract DAAB07-72-C-0259)

(AD-A058498; R-815; UILU-ENG-78-2208) Avail: NTIS HC A04/MF A01 CSCL 14/2

Two implementations of quadriphase direct-sequence spread-spectrum multiple-access (QDS/SSMA) communication systems are discussed and their performance is investigated. The average signal-to-noise ratio is related to the correlation parameters of the signature sequences for each system. The asymptotic behavior of the key aperiodic correlation parameters is investigated and preliminary numerical results are obtained. The results for QDS/SSMA are compared and contrasted with previous results on biphase direct-sequence spread-spectrum multiple-access systems. Author (GRA)

N79-13245# Naval Research Lab., Washington, D. C. Radar Div.

A PERSPECTIVE OF SYNTHETIC APERTURE RADAR FOR REMOTE SENSING

Merrill I. Skolnik May 1978 19 p refs Presented at the Syn. Aperture Radar Technol. Conf., Las Cruces, N. Mex., 3-10 Mar. 1978; sponsored by NASA and New Mexico State Univ.

(AD-A058356; AD-E000186; NRL-MR-3783) Avail: NTIS HC A02/MF A01 CSCL 17/9

Because of its unique capability for providing good resolution in the cross-range, as well as range dimension, synthetic aperture radar has proven to be of considerable interest for remote-sensing applications over both the land and the sea. In this tutorial report the characteristics and capabilities of synthetic aperture radar are discussed so as to identify those features particularly unique to SAR. Brief comparison is made between SAR and optical images. SAR is an example of a radar that provides more information about a target than simply its location. It is the spatial resolution and imaging capability of SAR that has made its application of interest, especially from spaceborne platforms. However, for maximum utility to remote sensing, it has been proposed that other information be extracted from SAR data, such as the cross section and the variation of cross section with frequency and polarization. Several of the special problem areas that might possibly limit the utility of SAR are mentioned, such as complexity, swath and resolution, image interpretation, need for calibration, EMC, as well as the handling of the large amounts of data generated from remote sensing applications. Author (GRA)

N79-13246# Army Missile Research and Development Command, Redstone Arsenal, Ala. Advanced Systems Concepts Office.

AN INVESTIGATION OF RADIATION TRANSFER THROUGH AEROSOLS

Bruce W. Fowler Jun. 1978 194 p refs

(AD-A058385; DRDMI-C-78-3) Avail: NTIS HC A09/MF A01 CSCL 20/3

Some aspects of the problem of radiative transfer through aerosols are investigated. The scattering of a plane wave of light of arbitrary wavelength by a cylindrically symmetric nonspherical particle of arbitrary size and refractive index is addressed. The Hertz vector formalism originally used by Mie to treat the spherical particle problem is extended to nonspherical particles. The electromagnetic boundary conditions are reduced to become a set of linear algebraic equations that are solved numerically. A computer code implementing the solution is developed and calculations for selected non spherical particles are presented. It is shown that the agreement between exact and approximate calculations for prolate spheroids is good. The multiple scattering of light by aerosols is also addressed through the Radiative Transfer equation. To consider more general problems associated with laser beam and image propagation, a solution of the two-dimensional Radiative Transfer equation is developed in the form of a numerical algorithm. A computer code implementing this algorithm is presented. Calculations are presented for both uniform and Gaussian profile beams. GRA

N79-13247# Air Force Academy, Colo.

PERFORMANCE OF GRAPHITE EPOXY AS AN ANTENNA GROUND PLANE Final Report

John E. Erickson and Oscar D. Graham Aug. 1978 63 p refs

(AD-A058346; USAFA-TR-78-4) Avail: NTIS HC A04/MF A01 CSCL 09/5

This final report describes work undertaken by members of the Department of Electrical Engineering at the USAF Academy, Colorado for the Post Doctoral Program/Rome Air Development Center/Griffiss AFB, N.Y. This effort involved a study of graphite

epoxy composite material as an antenna ground plane at the frequencies of 370 and 837 MHz. Five by five foot sheets of graphite epoxy were provided by the Composites Laboratory of the Air Force Flight Dynamics Laboratory at Wright-Patterson AFB. Antenna impedance and antenna pattern measurements were made using these graphite epoxy sheets and also an identically sized sheet of aluminum. These measurements were made with both monopole and dipole antennas and also with a UHF blade antenna from an F4 aircraft. Results show that the 50 ply sheet of graphite epoxy behaves identically with an aluminum ground plane when used with a monopole or dipole receiving antenna at 370 and 837 MHz.
Author (GRA)

N79-13248# Rockwell International Corp., Los Angeles, Calif.
THERMONUCLEAR EFFECTS ON REACTIVE RADOME MATERIALS Final Report, 1 Apr. - 30 Nov. 1977
Craig Sparling and John Schibler 1 Dec. 1977 60 p
(Contract DNA001-77-C-0092)
(AD-A058368; AD-E300304; DNA-4496F-1) Avail: NTIS HC A04/MF A01 CSCL 17/9

The environmental hardness of reactive array radomes has been demonstrated. Reactive array radome test panels successfully completed full Mil specification lightning strike testing without electrical or structural degradation. The panels were exposed to 10 high-level thermonuclear pulses with only minor paint discoloration. It was shown that with 20 mils of rain erosion coating over the external array, the panel dissipated a static charge without arcing or corona formation. A shielding effectiveness of greater than 20 dB in the HF band of EMP energy with the reactive array radome panels was demonstrated.
Author (GRA)

N79-13249# Alabama Univ., University. Dept. of Electrical Engineering.
IMPROVED BANDWIDTH AND PERFORMANCE FOR A DIGITAL WITH SIGNAL PROCESSOR Final Report, 16 May 1978 - 30 Jun. 1978
Ronald C. Houts Aug. 1978 6 p refs
(Grant DAAG29-76-G-0212)
(AD-A058440; ARO-13720.6-ELX) Avail: NTIS HC A02/MF A01 CSCL 17/9

The important results are summarized in this report. The basic problem studied was the effect of using various algorithms for specifying the digital filter coefficients for a moving target indicator (MTI) radar signal processor in terms of improving the usable percentage of the pulse repetition frequency (PRF) while retaining an acceptable level of clutter attenuation. This study concentrated on the design of multiband filters for suppression of both ground and weather clutter using a linear-phase filter algorithm. Furthermore, the substitution of minimum-phase filters for the aforementioned design examples plus high-pass filters (HPF) for ground clutter suppression was investigated. Finally, the role of MTI filter in frequency response was studied when the PRF was staggered, either on a pulse-to-pulse or block-to-block basis.
Author (GRA)

N79-13250# Ohio State Univ., Columbus. Electroscience Lab.
COMMUNICATION APPLICATIONS OF ADAPTIVE ARRAYS Quarterly Report
R. T. Compton Jun. 1978 7 p ref
(Contract N00019-78-C-0131)
(AD-A058552; ESL-710929-2) Avail: NTIS HC A02/MF A01 CSCL 17/2

This report describes progress under NASC Contract N00019-78-C-0131 during the second quarterly period. There are four areas of work under this contract. The first is a continuation of experimental work, started under the previous contract, on the use of adaptive arrays with AM and FM signals. The second and third areas involve research on the problem of frequency acquisition in adaptive arrays and the use of analog phase modulation for desired signal tagging. The last area involves the preparation of monograph on adaptive arrays. GRA

N79-13251# Science Applications, Inc., Bedford, Mass.
APPLICATIONS OF OPTICAL SIGNAL PROCESSING TO COMMUNICATIONS, COMMAND AND CONTROL Final Technical Report, 25 Jan. 1977 - 25 Jan. 1978
Frank A. Horrigan and William W. Stoner Griffiss AFB, N. Y. RADC Aug. 1978 52 p refs
(Contract F19628-77-C-0110; AF Proj. 4600)
(AD-A058721; SAI-77-511-BOS; RADC-TR-78-180) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report discusses the application of optical signal processing to synchronization and decoding of spread spectrum signals. Synchronization and decoding are first characterized as correlation operations. Three distinct optical correlation techniques are discussed in the context of spread spectrum requirements: brute force shadowcasting, noncoherent correlation via pupil masks, and conventional coherent optical matched filtering and correlation. The strong and weak points of each technique are identified. The noncoherent pupil mask technique is novel, and hence requires deeper theoretical and experimental exploration. For future work, an experimental comparison which encompasses all three competing techniques is outlined. Author (GRA)

N79-13252# Battelle Pacific Northwest Labs., Richland, Wash.
INITIAL ASSESSMENT: ELECTROMAGNETIC COMPATIBILITY ASPECTS OF PROPOSED SPS MICROWAVE POWER TRANSMISSION SYSTEM (MPTS) OPERATIONS
Feb. 1978 139 p refs
(Contract EY-76-C-1830)
(PNL-2482) Avail: NTIS HC A07/MF A01

An analysis of major concerns with regard to the effects on radio and electronic systems by the proposed Microwave Power Transmission System for transmitting power from a satellite solar power station to earth is presented. Author (DOE)

N79-13253# National Technical Information Service, Springfield, Va.
MODEMS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Sep. 1978
William E. Reed Oct. 1978 258 p Supersedes NTIS/PS-77/0968; NTIS/PS-76/0824; NTIS/PS-75/782; NTIS/PS-75/142 (NTIS/PS-78/1087/2; NTIS/PS-77/0968; NTIS/PS-76/0824; NTIS/PS-75/782; NTIS/PS-75/142) Avail: NTIS HC $28.00/MF $28.00 CSCL 17B

The design, selection, and utilization of modems are investigated in the cited Government-sponsored research reports, with applications to data transmission, laser communications, voice communications, and satellite communications. This updated bibliography contains 252 abstracts, 29 of which are new entries to the previous edition. GRA

N79-13254# National Technical Information Service, Springfield, Va.
MODEMS, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1974 - Sep. 1978
William E. Reed Oct. 1978 264 p Supersedes NTIS/PS-77/0969; NTIS/PS-76/0826
(NTIS/PS-78/1088/0; NTIS/PS-77/0969; NTIS/PS-76/0826) Avail: NTIS HC $28.00/MF $28.00 CSCL 17B

Reports from worldwide research are cited on the design, operating principles, and applications of modems, with applications to data transmission digital voice communication, and satellite communications. This updated bibliography contains 258 abstracts, 56 of which are new entries to the previous edition. GRA

N79-13255# Federal Communications Commission, Washington, D. C. Land Mobile Spectrum Management Div.
LAND MOBILE SPECTRUM UTILIZATION: DETROIT, MICHIGAN Final Report
Larry D. Reed, Keith A. Larson, and William V. Tranavitch Sep. 1977 56 p
(PB-284523/8; FCC/SSRSB/SMD-78/01) Avail: NTIS HC A04/MF A01 CSCL 17B

The extent of radio frequency utilization by FCC licensees in the Private Land Mobile Radio Services in the Detroit metropolitan area is described. Radio users in these services include among others: police and fire departments, hospitals, public utilities and a variety of private business enterprises. The report analyzes a large amount of monitoring data taken during September 19, 1977-September 28, 1977 at four locations in Detroit. The nature

of the monitoring and data analyses are described. The extent of frequency utilization is described in terms of three usage categories: low substantial, and very high. The rationale for these categories and their relationship to measured usage data are given. Summary tables enable direct comparison of the extent of usage by the various individual radio services, e.g., police, business, taxi, etc. Separate analyses are given for utilization by each of the land mobile services. The report also includes 90 percentile occupancy distributions to provide a more quantitative picture. GRA

N79-13254# Middleton (David), New York.
STATISTICAL-PHYSICAL MODELS OF MAN-MADE AND NATURAL RADIO NOISE. PART 3. FIRST-ORDER PROBABILITY MODELS OF THE INSTANTANEOUS AMPLITUDE OF CLASS B INTERFERENCE
David Middleton Jun. 1978 75 p refs
(Contract COM-OT-0124)
(PB-284862/0; NTIA/CR-78/1) Avail: NTIS HC A04/MF A01 CSCL 17B

The first-order statistical probability densities (pdf's) and the associated exceedance probabilities (PD's or APD's) are obtained for the instantaneous amplitudes (X), and instantaneous magnitudes, /X/, of Class B noise. These are needed not only for experimental studies but, also, particularly for the analysis and evaluation of the performance of optimum and suboptimum receivers in Class B interference environments. As in the earlier studies of the envelope statistics of Class B noise (Middleton, 1976), a two-function approximation is needed for the characteristic function and hence for the corresponding pdf's and PD's. Two methods of determining the six (basic) parameters which describe these first-order statistics and thus joining the approximate forms (pdf's and PD's) are outlined. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N79-13257 Stanford Univ., Calif.
CHARGE-COUPLED DEVICES FOR USE IN ELECTRONICALLY FOCUSED ULTRASONIC IMAGING SYSTEMS Ph.D. Thesis
John Dickinson Shott 1978 152 p
Avail: Univ. Microfilms Order No. 7822574

The development of the cascade charge-coupled device (C3D) designed specifically for electronically focused ultrasonic imaging systems is described. The fundamental limits of the C3D approach to ultrasonic imaging are investigated. The analysis includes the effects of incomplete charge transfer and the asynchronous transfer of charge between sections operating at different clock frequencies, with emphasis on the impact of these processes on the time-delay accuracy of the C3D lens and on the maximum level of sidelobe suppression. The first-generation C3D lens were fabricated and tested in a static water water tank. A second-generation device is proposed whose additional capabilities would include full interpolation of the field of view for a scan-line-free image presentation and on-chip apodization to obtain higher degrees of sidelobe suppression. Dissert. Abstr.

N79-13258 Stanford Univ., Calif.
A LOW-POWER DYNAMIC VARIABLE-GAIN AMPLIFIER FOR ULTRASONIC IMAGING SYSTEMS Ph.D. Thesis
James Coleman Long 1978 179 p
Avail: Univ. Microfilms Order No. 7822534

A monolithic silicon integrated-circuit variable-gain amplifier was fabricated, which has no external parts, a minimum of noise, precisely controlled dynamically variable gain, low power consumption, and wide bandwidth. The amplifier is based on ion-implanted junction field effect transistors (JFETs) and is to be applied in a unique high-resolution real-time three dimensional ultrasonic imaging system (ULISYS) for medical diagnosis. Variable-gain amplifier techniques were analyzed for lower power drain and noise, high gain precision, and a large signal-handling capacity. A breadboard simulation of the amplifier was performed, and measurements confirmed the theoretical analysis. Possible integrated JFET structures were computer simulated, and the sensitivities of JFET electrical parameters to variations in the processing parameters were calculated. Dissert. Abstr.

N79-13259 California Univ., Santa Barbara.
BLOCK IMPLEMENTATION OF ONE-DIMENSIONAL RECURSIVE DIGITAL FILTERS Ph.D. Thesis
Rangasamy Gnanasekaran 1978 130 p
Avail: Univ. Microfilms Order No. 7822745

The Burrus technique is extended to develop a higher order block difference equation and a set of relations between the block matrices are established. A set of block state state-structures is developed. Block version of certain scalar structures are shown to be implementable. A proof of commutativity property on the relationship between the poles of the block filter and its associated scallar filter is formally established. A technique is suggested to recover the original scalar transfer function from a given block structure. This procedure is extended to find an absolute bound on the limit cycles of a general digital filter structure.
Dissert. Abstr.

N79-13260 Texas Univ. at Arlington.
OPTIMAL VOLTAGE AND REACTIVE POWER PLANNING Ph.D. Thesis
Bernard Arthur Hughes 1978 184 p
Avail: Univ. Microfilms Order No. 7821198

Existing voltage/reactive power controllers are fully utilized and the final installation pattern for the required new shunt compensation is comprised of discrete, standard size components. Moreover, the solution forces all contingencies to be feasible at minimum cost. A reduced gradient method of optimization is used in conjunction with simplex and branch and bound routines. The linearized and decoupled Newton-Raphson load flow and its linear reactive network are utilized throughout the solutions procedure. The method and the related computer program was tested on a 10 contingency case of the 282 bus New York City transmission system. Dissert. Abstr.

N79-13261*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PORTABLE APPLIANCE SECURITY APPARATUS Patent Application
James J. Kerley, Jr., inventor (to NASA) Filed 17 Nov. 1978 14 p
(NASA-Case-GSC-12399-1; US-Patent-Appl-SN-961831) Avail: NTIS HC A02/MF A01 CSCL 09A

The present invention relates to a heavy gauge case into which a hand held computer or other portable appliance is locked for theft prevention. The case has a rear access opening that is enclosed by a back plate and secured to a desk top or other stationary object by a hold-down cable. NASA

N79-13262*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TIME DELAY AND INTEGRATION DETECTORS USING CHARGE TRANSFER DEVICES Patent Application
David H. McCann (Westinghouse Electric Corp., Baltimore), Marvin H. White (Westinghouse Electric Corp., Baltimore), and Alfred P. Turly, inventors (to NASA) (Westinghouse Electric Corp., Baltimore) Filed 22 Sep. 1978 17 p Sponsored by NASA
(NASA-Case-GSC-12324-1; US-Patent-Appl-SN-945043) Avail: NTIS HC A02/MF A01 CSCL 09A

An imaging system comprising a multichannel matrix array of charge coupled devices (CCD) is described. Sensor cells in each channel are subdivided and operated in discrete intercoupled groups or subarrays with a readout CCD shift register terminating each end of the channels. Clock voltages are applied to the subarrays and are manipulated to selectively cause charge signal flow in each subarray in either direction independent of the other subarrays. The array is divided into six independent subarrays, three on each side of the array, such that each channel common to three subarrays is divided into three sections of three sensor cells each. By selective application of four phase

clock voltages, either one, two, or all three of the sections cause charge signal flow in one direction, while the remainder cause charge signal flow in the opposite direction. This creates a form of selective electronic exposure control which provides an effective variable time delay and integration of three, six, or nine sensor cells or integration stages. NASA

N79-13263*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MICROWAVE POWER TRANSMITTING PHASED ARRAY ANTENNA RESEARCH PROJECT Summary Report
Richard M. Dickinson 15 Dec. 1978 94 p refs
(Contract NAS7-100)
(NASA-CR-157843; JPL-Pub-78-28) Avail: NTIS HC A05/MF A01 CSCL 09C

An initial design study and the development results of an S band RF power transmitting phased array antenna experiment system are presented. The array was to be designed, constructed and instrumented to permit wireless power transmission technology evaluation measurements. The planned measurements were to provide data relative to the achievable performance in the state of the art of flexible surface, retrodirective arrays, as a step in technically evaluating the satellite power system concept for importing to earth, via microwave beams, the nearly continuous solar power available in geosynchronous orbit. Details of the microwave power transmitting phased array design, instrumentation approaches, system block diagrams, and measured componient and breadboard characteristics achieved are presented. B.B.

N79-13264# Center for Naval Analyses, Arlington, Va.
TEMPERATURE AND CURRENT DEPENDENCE OF DEGRADATION IN RED-EMITTTING GaP LED-S
J. M. Ralston and J. W. Mann Jun. 1978 41 p refs Prepared in cooperation with Bell Telephone Labs., Murray Hill, N. J.
(AD-A058538; CNA-PP-226) Avail: NTIS HC A03/MF A01 CSCL 09/1

Experimental studies have been performed on several aspects of the degradation of electroluminescent quantum efficiency in Zn,O-doped GaP light emitting diodes. The dependence of degradation on stress temperature, stress current (experienced during accelerated aging) and measurement current (at which quantum efficiency is evaluated) has been empirically determined from experiments on several lots of devices. It is shown that degradation is dominated by a decrease in bulk p-side radiative recombination efficiency. The degradation of other factors (such as injection efficiency and injection ratio) contributing to the overall electroluminescent efficiency has only a secondary effect. Moreover, it is shown empirically that the dependences of degradation on temperature and stress current are separable. Author (GRA)

N79-13265# Auburn Univ., Ala. Engineering Experiment Station.
DEVELOPMENT OF TECHNOLOGIES AND PROCEDURES FOR ADVANCED MICROCIRCUIT PROTOTYPE FABRICATION Final Technical Report
B. D. Carroll, K. B. Cook, Jr., D. V. Kerns, and T. D. Slagh Jul. 1978 268 p refs
(Contract DAAK40-77-C-0042)
(AD-A058613; AU-EE-AMC-77-0042-1) Avail: NTIS HC A12/MF A01 CSCL 09/5

This report investigates the problems involved in implementing integrated circuits. Its six separate parts address hybrid integration, computer-aided thermal modeling, thermal simulation, thermal analysis and measurement, thick film resistor noise, noise in optical isolators, automated conductor routing, computer aided design, thin-film microcircuits on flexible substrates, and logic simulation. Author (GRA)

N79-13266# Naval Research Lab., Washington, D. C. Transducer Branch.
HYDROPHONE PREAMPLIFIER OPTIMIZATION-HYBRID MICROELECTRONICS FOR LOW-NOISE HYDROPHONES Final Report
C. K. Brown and A. C. Tims 15 Jun. 1978 29 p ref
(ZF11121003)
(AD-A058590; AD-E000200; NRL-8218) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report presents a dc and low-frequency ac analysis of a low-noise preamplifier design. It also describes how the circuit has been miniaturized to hybrid form and packaged in a TO-99 can. Since the early 1960's, remarkable growth has occurred in the quality of electronic amplifier design for underwater applications. The introduction of the junction field-effect transistor (JFET) resulted in hydrophone preamplifier designs having low-noise, high input impedance, broad bandwidth, and wide dynamic range. The further development of hybrid techniques has allowed these amplifiers to shrink greatly in size and cost. The preamplifier circuit described has been optimized at the Underwater Sound Reference Detachment of NRL into a rugged integrated (hybrid) circuit suitable for low-noise hydrophone applications. Its self-noise is typically -118 dBV for a 1-G ohms input impedance. It operates on a single power supply and has a 100-kHz bandwidth. Equations are developed, suitable for programmable calculators, which analyze the ac and dc conditions in the circuit. GRA

N79-13267# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
MNOS BORAM MANUFACTURING METHODS AND TECHNOLOGY PROJECT Quarterly Report, 1 Jan. 1978 - 31 Mar. 1978
J. E. Brewer Jul. 1978 117 p
(Contract DAAB07-76-C-0048)
(AD-A058773; Rept-78-0481; DELET-TR-76-0048-6; QR-6)
Avail: NTIS HC A07/MF A01 CSCL 09/1

A manufacturing methods project has been initiated to establish a pilot production line for metal nitride oxide semiconductor (MNOS) block oriented random access memory (BORAM) multichip hybrid circuits. This report presents some measured characteristics of the BORAM 6002 chip. Author (GRA)

N79-13268# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
COMPUTER MODELING OF DIODE CIRCUITS AND ITS APPLICATIONS Final Report, Jun. 1976 - Nov. 1977
Zeev I. Bogan and James B. Y. Tsui Mar. 1978 66 p refs
(AF Proj. 7633)
(AD-A058400; AFAL-TR-77-266) Avail: NTIS HC A04/MF A01 CSCL 09/4

This technical report presents a computer model for calculation of multiple diode circuits. The model solves iteratively a system of nonlinear equations in the time domain and obtains frequency domain information by means of a Fourier series expansion. Applications for this model include prediction of one and two tone intermodulation performance for single-ended, balanced and double balanced mixers, calculation of the multiple-signal capture range of back-to-back diode limiters, and prediction of the performance of a frequency doubling front-end for detection and identification of Pseudo-Noise BPSK modulated signals. Experimental data was collected for some diode circuits. This data agreed qualitatively with the calculated results. Author (GRA)

N79-13269# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
RADIATION-INDUCED RESPONSE IN SHIELDED SINGLE AND TWISTED-PAIR CONDUCTOR CABLES Interim Report
Paul A. Beemer and Francis Hai 25 Aug. 1978 31 p
(Contract F04701-77-C-0078)
(AD-A059190; TR-0078(3950-04)-5; SAMSO-TR-78-124)
Avail: NTIS HC A03/MF A01 CSCL 09/1

Radiation responses were measured for three shielded wires. Estimates of the possible lot-to-lot variability of the responses were limited by extreme variations in construction details of supposedly identical wires from the same manufacturer. Polymer filling of the gaps between shield and wires in multiconductor cables has been shown to provide a significant reduction in the magnitude of the radiation response (80 to 90% for these shielded pairs). Author (GRA)

N79-13270# Microwave Associates, Inc., Burlington, Mass.
MM AND T PROGRAM FOR THE ESTABLISHMENT OF PRODUCTION TECHNIQUES FOR HIGH POWER BULK SEMICONDUCTOR LIMITERS Quarterly Report, 23 Sep. - 22 Dec. 1977
Yoginder Anand and Richard Bilotta Jan. 1978 37 p refs
(Contract DAAB07-76-C-0039)

(AD-A059195; ECOM-0039-6; QR-6) Avail: NTIS HC A03/MF A01 CSCL 09/1

X-band bulk limiters have been fabricated using high resistivity silicon rho 12,000 to 18,000 ohm-cm, p-type, uncompensated (111) orientation. These bulk limiters exhibit 3.0 db bandwidth of 0.6 - 0.8 GHz and power handling capability of 20 - 30 kW. As a cost reduction measure, low cost stamped copper irises have been introduced for mounting the bulk limiter chips. The limiter input section was redesigned to obtain improved performance and prevent arcing at high RF power levels. Various parameters are being optimized to achieve both bandwidth and RF power goals of the contract. Author (GRA)

N79-13271# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

INTEGRATED VARACTOR TUNED MICROWAVE SOURCES Final Report, 15 Sep. 1975 - 30 Sep. 1977

J. W. Amoss, E. L. Meeks, and N. W. Cox Jan. 1978 139 p refs

(Contract N00173-76-C-0044)

(AD-A059045) Avail: NTIS HC A07/MF A01 CSCL 09/5

This report describes the results of a study in which the objectives were to develop varactor-tuned microwave oscillator circuits and planar device technology leading to minimum parasitic monolithic varactor-tuned microwave oscillators (VCOs). A wideband varactor-tuned Gunn oscillator of lumped element construction was developed which tuned from 6.0 GHz to 11.5 GHz, a 63% tuning range based on the midband frequency of 8.75 GHz. This tuning range exceeds that reported previously by others for varactor-tuned oscillators with center frequency in X-band. Although of lumped element construction, the circuit is adaptable to monolithic construction. It consists of series-connected Gunn and varactor chips which are series resonated at the midband frequency by an inductive wire, a wideband lumped element matching section, and lumped element bias sections. Performance data of this circuit using various types of varactors are presented. Excellent tuning linearity occurred when low-high-low IMPATT chips were used as tuning varactors. A deviation of + or - .5% from linear tuning was obtained over a 2.5 GHz range with less than 15 volt change in tuning voltage using these devices. Planar Gunn and varactor devices, developed on this program, were tested in various microwave circuits and found to operate at lower frequencies than conventional Gunns. GRA

N79-13272# Exxon Research and Engineering Co., Linden, N. J. Products Research Div.

SELF-GENERATED VOLTAGES AND THEIR RELATIONSHIP TO WEAR UNDER BOUNDARY LUBRICATED CONDITIONS Final Report, May 1975 - Jul. 1978

Irwin Leonard Goldblatt Jul. 1978 189 p refs

(Contract N00014-75-C-1080)

(AD-A058611; EXXON/RL6PH.78) Avail: NTIS HC A09/MF A01 CSCL 20/11

A program has been carried out to determine the relationship which exists between Self-Generated Voltages and wear under Boundary Lubricated Conditions. The observation that voltages are generated between wearing members is shown to be unrelated to such factors as fluid conductivity or fluid viscosity. These voltages are shown to be associated with the wear process itself. A relationship has, indeed, been obtained between wear and Self-Generated Voltages and has been found for both a steel-on-steel system and an aluminum-on-steel system under dry air blanketing. Under these conditions, at low wear, the measured voltages are several millivolts in magnitude, and they decrease as wear increases. A preliminary mechanism to explain how the voltages are generated under the Boundary Lubricated Conditions is discussed. It is suggested that there are two fundamental electrochemical processes which occur under conditions of Boundary Lubrication and wear. One is an electron transfer process involving the shifting of a near surface electron from the metal to an adsorbed surface layer. The other is an oxidation process in which the metal surface is chemically oxidized while another species is chemically reduced. The Self-Generated Voltages and the relative changes in their magnitude and polarity are determined by the relative importance of the above noted processes under the test conditions. Author (GRA)

N79-13273# RCA Labs., Princeton, N. J.

TRANSFERRED-ELECTRON LOGIC DEVICE (TELD) DEVELOPMENT Annual Report, 15 Dec. 1976 - 14 Mar. 1978

L. C. Upadhyayula, R. E. Smith, and J. F. Wilhelm Sep. 1978 35 p refs

(Contract N00014-75-C-0100; RF54582001)

(AD-A058682; PRRL-78-CR-15) Avail: NTIS HC A03/MF A01 CSCL 09/5

The objective of this research program is to develop MSI circuits using GaAs transferred-electron logic devices for gigabit-rate signal processing applications. The test vehicles used for technology development are exclusive-OR, Carry, and Full Adder circuits. GRA

N79-13274# Watkins-Johnson Co., Scotts Valley, Calif.

HIGH CONTRAST CRT Interim Technical Report, 1 May - 31 Dec. 1977

Norman H. Lehrer May 1978 47 p

(Contract DAAB07-77-C-2639)

(AD-A059269; ECOM-77-2639-2; ITR-2) Avail: NTIS HC A03/MF A01 CSCL 09/1

The fabrication processes for the two La2O2S films and the non-reflective layer were optimized with regard to thin layer thickness and processing temperature. Several bilayer screens were produced using both Type 1723 and Type 1720 glass substrates. Demountable test data were taken on these films. Films fabricated on Type 1720 glass exhibit 80% of the efficiency of those fabricated on sapphire while those fabricated on Type 1723 were 40% as efficient. Many different experiments were tried in an effort to seal the Type 1720 or Type 1723 glass to the 7052 funnel all of which failed. Author (GRA)

N79-13275# Honeywell, Inc., St. Petersburg, Fla. Avionics Div.

MANUFACTURING METHODS AND TECHNOLOGY ENGINEERING FOR TAPE CHIP CARRIER Quarterly Report, 1 Jan. - 31 Mar. 1978

William Rodrigues DeMiranda Aug. 1978 70 p refs

(Contract DAAB07-77-C-0526; DA Proj. 1L7-62705-AH-94)

(AD-A058609; DELET-TR-77-0526-3; QR-1) Avail: NTIS HC A04/MF A01 CSCL 09/5

The contract is aimed at establishing and demonstrating the feasibility of an automated assembly line for hybrid microcircuits using tape chip carrier technology for semiconductor devices whenever practical. The automated line will also make use of automatic substrate handling equipment to move partially assembled devices in and out of magazines. GRA

N79-13276# Naval Surface Weapons Center, Dahlgren, Va.

PULSE CHARGING OF NANOFARAD CAPACITORS TO TENS OF KILOVOLTS FROM THE SHOCK DEPOLING OF PZT FERROELECTRIC CERAMICS Final Report

W. Mock, Jr. Apr. 1978 75 p refs

(WF32382501)

(AD-A058607; NSWC/DL-TR-3804) Avail: NTIS HC A04/MF A01 CSCL 09/5

Gas gun impact techniques have been used to pulse charge nanofarad capacitors from the shock depoling of PZT 56/44 and PZT 95/5 ferroelectric ceramics. The PZT materials were depoled in the normal mode. Pulse powers of hundreds of kilowatts were produced in a few microseconds. The PZT 56/44 material was impacted in the stress range from 4.4 to 11.8 GPa. A maximum load voltage of 55 kV was produced at 7.9 GPa. Shock-induced electrical breakdown in the PZT material occurred at 11.8 GPa. The PZT 95/5 material was impacted at 1.4 and 2.9 GPa stress levels. A maximum load voltage of 81 kV was produced at the higher stress. Author (GRA)

N79-13277# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.

LINEAR 1 kW MULTITONE TOPOSCATTER TWT Interim Report, 1 Jan. - 31 Apr. 1978

A. L. Rousseau Aug. 1978 30 p

(Contract DAAB07-77-C-2713; DA Proj. 1L7-62705-AH-94)

(AD-A058608; EDD-W-07564; DELET-TR-77-2713-2; IR-2)

Avail: NTIS HC A03/MF A01 CSCL 09/1

This report covers the second triannual effort of a Research and Development program to design, construct, and test an

advanced, high efficiency traveling-wave tube designed to amplify multiple signals while minimizing any mixing products which result from non-linear operation. The tube will be operated in the linear region below saturation; tube efficiency will be enhanced by means of a four stage depressed collector. During the report period the scaled electron gun was constructed and evaluated in the demountable beam analyzer. The detail mechanical design for the gun to be used in the tube was completed. Parts were ordered. Phase shift measurements of the RF circuit were completed. Circuit parts for the tube were ordered. The mechanical design of the four stage collector was continued. Thermal analysis led to a change in the electrode configuration to handle the high power densities. Design of the overall packaging was started. Author (GRA)

N79-13278# National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
JOSEPHSON A/D CONVERTER DEVELOPMENT Annual Technical Report, 1 May 1977 - 30 Apr. 1978
C. A. Hamilton, R. E. Harris, R. L. Kautz, R. L. Peterson, and D. B. Sullivan 1 Sep. 1978 71 p refs
(Contract N00014-77-F-0048; RF54582001)
(AD-A058638; NBS-SR-724-8-78) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes the first year of an effort to demonstrate an ultra-high-speed analog-to-digital converter using superconducting electronics. Fabrication methods capable of producing a complete eleven layer circuit have been developed. Testing techniques enable 70 ps risetime signals to be sent onto or off of a chip. Experimental and theoretical characterizations of superconducting striplines are in good agreement. Author (GRA)

N79-13279# Stone and Webster Engineering Corp., N. Y.
TECHNICAL NOTES FOR THE CONCEPTUAL DESIGN FOR AN ATMOSPHERIC FLUIDIZED-BED DIRECT COMBUSTION POWER GENERATING PLANT
Apr. 1978 600 p refs
(Contract EF-77-C-01-2583)
(HCP/T2583-01/3) Avail: NTIS HC A22/MF A01

The design, arrangement, thermodynamics, and economics of a 578 MW (e) (nominal gross) electric power generating plant equipped with atmospheric fluidized bed (AFB) boiler are described. Information is included on capital and operating costs, process systems, electrical systems, control and instrumentation, and environmental systems. DOE

N79-13280# Stone and Webster Engineering Corp., N. Y.
TECHNICAL NOTES FOR THE CONCEPTUAL DESIGN FOR AN ATMOSPHERIC FLUIDIZED-BED DIRECT COMBUSTION POWER GENERATING PLANT
Apr. 1978 664 p
(Contract EF-77-C-01-2583)
(HCP/T2583-01/2) Avail: NTIS HC A99/MF A01

The design, arrangement, thermodynamics and economics of a 592 MW(e) (nominal) gross electric power generating plant equipped with a Babcock and Wilcox Company (B and W) atmospheric fluidized bed (AFB) boiler are described. Information is included on capital and operating costs, process systems, electrical systems, control and instrumentation, and environmental systems. This document represents a portion of an overall report describing the conceptual designs of two atmospheric fluidized bed boilers and balance of plants for the generation of electric power and the analysis and comparison of these conceptual designs to a conventional pulverized coal-fired electric power generation plant equipped with a wet limestone flue gas desulfurization system. DOE

N79-13281# Mathtech, Inc., Princeton, N. J.
IMPACT OF ELECTRIC PASSENGER AUTOMOBILES ON UTILITY SYSTEM LOADS, 1985 - 2000
E. P. Marfisi, C. W. Upton, and C. E. Agnew Jul. 1978 443 p refs
(EPRI-EA-623) Avail: NTIS HC A19/MF A01

A supply model is described which includes an Electric Vehicle Design Model, and calculates factors such as weight, battery size, and cost of a vehicle from user-supplied design characteristics. In the next stage of the analysis, calculation of electric vehicle sales and stocks, the 'hedonic' approach is adopted which states that consumers' demand for a good is a derived demand for a bundle of characteristics (comfort, cost, performance, and the like) provided by the vehicle. Using this approach, a demand model was developed that forecasts the future stock and sales of electric vehicles and their competitors--internal combustion engine (ICE) vehicles. The final step in the analysis is the calculation of electricity loads and air quality impacts on a national basis for the period 1985 to 2000, and also for New York, Chicago, Los Angeles, and Washington, D.C. By end of the century, the models predict that approximately 141 million passenger vehicles will be on the road, and that 11 to 13 million of these will be electric vehicles, incorporating an advanced battery. DOE

N79-13282# National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
SHF IMPULSE GENERATOR Final Report, May - Sep. 1977
James R. Andrews and Eugene E. Baldwin Jun. 1978 76 p refs Sponsored in part by AFAL
(PB-285233/3; NBSIR-78-888) Avail: NTIS HC A05/MF A01 CSCL 09E

A superhigh frequency impulse generator is described in detail. The generator produces three different waveforms. The first is a simple impulse of 1 volt amplitude (3 V option) and 60 ps duration with a useful spectrum (15 db down) extending from low frequencies out to 9 GHz. The second waveform is a single cycle 5 GHz sine wave (doublet)of 0.8 volts peak-to-peak amplitude (1.6V option). Its useful spectrum extends from 0.5 GHz to 11.7 GHz. The third waveform is an exponentially damped RF pulse. It has a center frequency of 12.5 GHz and a damping time constant of 1/4 ns. The peak-to-peak amplitude is 0.8 volts. The useful spectrum extends from 6 GHz to 18 GHz. GRA

N79-13283# National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
APPLICATIONS OF THE HOMOMORPHIC TRANSFORMATION TO TIME DOMAIN MEASUREMENT PROBLEMS
Sedki M. Riad and Norris S. Nahman Jun. 1978 208 p refs
(PB-285206/9; NBSIR-78-881) Avail: NTIS HC A10/MF A01 CSCL 09D

A homomorphic deconvolution transform was developed and applied successfully to remove the time-windowing restriction required in many time domain measurements. Examples were presented including problems in time domain analysis of linear networks and dielectric spectroscopy. Scattering and multiple reflection in antenna (radiation) systems were considered and treated. Also considered was the development of a model for a 28 picosecond resolution feed through sampling-head, and the models step response was computed. The homomorphic transformation was used to deconvolve the models impulse response from the simulated output. GRA

N79-13284# National Bureau of Standards, Washington, D. C.
EXPLORATORY STUDY OF TEMPERATURES PRODUCED BY SELF-HEATING OF RESIDENTIAL BRANCH CIRCUIT WIRING WHEN SURROUNDED BY THERMAL INSULATION Final Report
Robert W. Beausoliel, William J. Meese, and Lawrence S. Galowin Jul. 1978 55 p refs Sponsored by DOE
(PB-284711/9; NBSIR-78-1477) Avail: NTIS HC A04/MF A01 CSCL 09A

Preliminary determination under laboratory conditions of temperatures that might develop on residential electrical wiring covered by thermal insulation when carrying rated currents or currents slightly above rated values is reported. The results show that temperatures on conductors surrounded by thermal insulation can greatly exceed the maximum service temperatures for the wire insulation. Results also show that some types of insulation currently used to retrofit buildings may fill wall outlet boxes and contact the current carrying elements and connections of duplex receptacles. GRA

N79-13285# Pennsylvania State Univ., University Park. Dept. of Electrical Engineering.
ELECTRICAL MATERIALS ANALYSIS - ARCING Annual Progress Report
Frederick C. Trutt, James W. Robinson, Lloyd A. Morley, and Paul M. Zahn 30 Dec. 1977 109 p refs

(Grant G0155197)
(PB-284946/1; BM-OFR-90-78) Avail: NTIS HC A06/MF A01 CSCL 08I

Research performed on arcing faults and their interactions with electrical insulating materials within coal mine power system enclosures is described. Primary areas include: the development of a theoretical procedure for computation of three-phase and line-to-line arcing fault currents as a function of time; formulation of an arc model based upon thermal-arc plasma properties so that arc voltages and energies may be computed; development of a simulation for pressure and temperature rises when an arc interacts with an electrical insulating material within an enclosure; and experimental evaluation of electrical insulating materials in terms of their tendency to support an arc as well as their potential contribution to enclosure pressure rises. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N79-13286 New York Univ., N. Y.
THE FLUID DYNAMIC LIMIT AND SHOCKS FOR A MODEL BOLTZMANN EQUATION Ph.D. Thesis
Russel Edward Caflisch 1978 98 p
Avail: Univ. Microfilms Order No. 7814199

A model of gas kinetics is studied. It describes a mathematical idealization of a discrete-velocity gas of particles in one dimension subject to a simple binary collision mechanism. The gas can be described by a model Boltzmann equation or by model fluid equations, both Euler equations and Navier-Stokes equations. A simple steady shock in the Euler flow is considered and can be shown to be smoothed out using either the Navier-Stokes or Boltzmann equations. It was also found that the Navier-Stokes and Boltzmann shock profiles agree for weak shocks. Dissert. Abstr.

N79-13287 Georgia Inst. of Tech., Atlanta.
THE PRESSURE FIELD GENERATED BY A FLUID FILM ENTRAINED BETWEEN TWO NON-CONFORMING ELASTIC BODIES Ph.D. Thesis
Richard Kerr Kunz 1978 143 p
Avail: Univ. Microfilms Order No. 7822699

Methods are developed for analytically determining the pressure field in an elastohydrodynamic (EHD) system, assuming that experimentally obtained film thickness data are available. The EHD system consists of two elastic bodies with non-conforming surfaces, separated by a thin fluid film which is entrained between them due to their relative motion. In addition, there is a normal force transmitted between the bodies through the fluid. Two cases are investigated: the two-dimensional case, in which the solid bodies consist of two parallel cylinders or a cylinder and a half-plane; and the three-dimensional case, consisting of two spheres or a sphere and a half-space. An error analysis is presented to demonstrate the feasibility of the methods. Also given are listings of computer programs developed to accept as input the film thickness values throughout the EHD zone, and compute the pressure field for both two- and three-dimensional cases. Dissert. Abstr.

N79-13288* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HEAT EXCHANGER Patent
Daniel E. Sokolowski, inventor (to NASA) Issued 22 Aug. 1978 6 p Filed 19 Mar. 1975 Supersedes N75-19579 (13 - 11, p 1244)
(NASA-Case-LEW-12252-1; US-Patent-4,107,919; US-Patent-Appl-SN-559847; US-Patent-Class-165-169; US-Patent-Class-60-267; US-Patent-Class-239-127.1) Avail: US Patent and Trademark Office. CSCL 20D

A heat exchanger, as exemplified by a rocket combustion chamber, is constructed by stacking thin metal rings having microsized openings therein at selective locations to form cooling passages defined by an inner wall, an outer wall and fins. Suitable manifolds are provided at each end of the rocket chamber. In addition to the cooling channel openings, coolant feed openings may be formed in each of rings. The coolant feed openings may be nested or positioned within generally U-shaped cooling channel openings. Compression on the stacked rings may be maintained by welds or the like or by bolts extending through the stacked rings.

Official Gazette of the U.S. Patent and Trademark Office

N79-13289* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HEAT EXCHANGER AND METHOD OF MAKING Patent
Anthony Fortini and John M. Kazaroff, inventors (to NASA) Issued 22 Aug. 1978 5 p Filed 19 Mar. 1975 Supersedes N75-19580 (13 - 11, p 1244)
(NASA-Case-LEW-12441-1; US-Patent-4,108,241; US-Patent-Appl-SN-559846; US-Patent-Class-165-146; US-Patent-Class-165-169; US-Patent-Class-60-267; US-Patent-Class-239-127.1) Avail: US Patent and Trademark Office CSCL 20D

A heat exchanger of increased effectiveness is disclosed. A porous metal matrix is disposed in a metal chamber or between walls through which a heat-transfer fluid is directed. The porous metal matrix has internal bonds and is bonded to the chamber in order to remove all thermal contact resistance within the composite structure. Utilization of the invention in a rocket chamber is disclosed as a specific use. Also disclosed is a method of constructing the heat exchanger.

Official Gazette of the U.S. Patent and Trademark Office

N79-13290 Stanford Univ., Calif.
MODAL CONTENT OF NOISE GENERATED BY A COAXIAL JET IN A PIPE Ph.D. Thesis
Edward J. Kerschen 1978 271 p
Avail: Univ. Microfilms Order No. 7822525

Noise generated by air flow through a coaxial obstruction in a long, straight pipe was studied for the modal characteristics of the noise field inside the pipe and downstream of the restriction. The measured modal pressure spectra were converted to modal power spectra and integrated over the frequency range 200-6000 Hz. The acoustic efficiency levels (acoustic power normalized by jet kinetic energy flow), when plotted vs. jet Mach number, showed a strong dependence on the ratio of restriction diameter to pipe diameter. The acoustic efficiency levels of the nozzles and orifices agreed closely, when the comparison was made using nozzle exit plane and orifice vena contracta conditions. Dissert. Abstr.

N79-13291 Wisconsin Univ. - Madison.
TRANSIENT CONVECTION IN VAPORIZING LIQUID LAYERS Ph.D. Thesis
Sukhminder Singh Grewal 1978 245 p
Avail: Univ. Microfilms Order No. 7815409

A 21 cm Mach-Zehnder Interferometer is used to examine the vaporization of a quiescent liquid layer. In one set of experiments the evaporation of this layer through a diffusion column is observed; the interferometer fringes in the liquid and in the vapor region are recorded simultaneously to obtain temperature and concentration profiles respectively. The other set of experiments are on the depressurization of the liquid layer with bubble nucleation (both at walls and within the liquid bulk) suppressed. The interferograms are recorded using high-speed photography. For both experiments, the vaporization at the surface results in a cold unstable layer of liquid with the eventual onset of convection. Dissert. Abstr.

N79-13292 Toledo Univ., Ohio.
HOT WATER COOLING FROM SPRAY ARRAYS Ph.D. Thesis
Gerald S. Jakubowski 1978 199 p
Avail: Univ. Microfilms Order No. 7824523

The interaction that takes place between adjacent flat hot water sprays for various configurations of nozzles in spray arrays is investigated. A nozzle cooling efficiency was defined in terms of the local wet bulb temperature. The interaction between sprays was determined by finding the overall nozzle cooling efficiency for the array. A dimensional analysis of the experimental data

showed that an optimum spacing exists between nozzles in a spray array and can be determined in terms of the equivalent orifice diameter and the spray Reynolds number. A step-by-step procedure was outlined which allows a designer of a spray cooling system to determine the spray conditions necessary for producing a required amount of cooling. Dissert. Abstr.

N79-13293 Toledo Univ., Ohio.
FINITE ELEMENT ANALYSIS OF FREE JET IMPINGEMENT Ph.D. Thesis
Timothy N. Obee 1978 224 p
Avail: Univ. Microfilms Order No. 7822028

An analysis of axisymmetric free jet impingement onto finite disks was performed using the finite element method. The finite element method employs the velocity potential as the dependent variable and six node triangle elements to represent the region of flow. The analysis was divided into three parts corresponding to three distinct regions of the flow. The major result achieved from this investigation was the development of a technique to locate the free surface in all three regions. The method employed to locate the free surface is systematic, convergent and stable. In addition, the velocity profiles along selected lines of constant values of the potential were determined. Finally, a comparison between the numerical results using this approach and existing experimental data was made. Dissert. Abstr.

N79-13294 Stanford Univ., Calif.
LARGE EDDY SIMULATION OF INCOMPRESSIBLE TURBULENT CHANNEL FLOW Ph.D. Thesis
Parviz Moin 1978 149 p
Avail: Univ. Microfilms Order No. 7822546

The three-dimensional, time-dependent primitive equations of motion have been numerically integrated for the case of turbulent channel flow. For this purpose, a partially implicit numerical method was developed. The equation of continuity is solved directly. The residual field motions were simulated through an eddy viscosity model, whereas the large-scale field was obtained directly from the solution of the governing equations. An important portion of the initial velocity field was obtained from the solution of the linearized Navier-Stokes equations. The pseudospectral method was used for numerical differentiation in the horizontal directions, and second-order finite-difference schemes were used in the direction normal to the walls. It was shown that the Large Eddy Simulation technique is capable of reproducing some of the important features of wall-bounded turbulent flows. Dissert. Abstr.

N79-13295 Stanford Univ., Calif.
LARGE-EDDY SIMULATION OF A TURBULENT MIXING LAYER Ph.D. Thesis
Nagi Nicolas Mansour 1978 210 p
Avail: Univ. Microfilms Order No. 7822537

The three-dimensional, time-dependent (incompressible) vorticity equations was used to simulate numerically the decay of isotropic box turbulence and time-developing mixing layers. The vorticity equations are spatially filtered to define the large-scale turbulence field, and the subgrid scale turbulence is modeled. A general method was developed to show numerical conservation of momentum, vorticity and energy that is much simpler than previous methods and is widely applicable. The terms that arise filtering the equations were treated (for both periodic boundary conditions and no-stress boundary conditions) in a fast and accurate way by using fast fourier transforms. Use of vorticity as the principal variable is shown to produce results equivalent to those obtained by use of the primitive variable equations. Dissert. Abstr.

N79-13296 Dartmouth Coll., Hanover, N.H.
FLOW OF BUBBLES THROUGH NOZZLES Ph.D. Thesis
Jing Tzong Kuo 1978 293 p
Univ. Microfilms Order No. 7822081

A simple and well-defined two-phase flow situation was set up in the laboratory. A range of liquid flow fields was set up by flowing water through nozzles. Individual bubbles were injected into the water stream and their trajectories were recorded to provide data for evaluation and comparison with theories. A computer based optical system was designed for fast data acquisition. A mathematical model was set up to predict the bubble motion. Various forces included in the model are the drag force, the apparent mass force, the buoyancy force, the bubble expansion force and the history forces. Comparisons between experiments and theories were made through a 'point to point' numerical testing procedure. Results show that the bubble trajectory can be reasonably predicted (within 10% accuracy) by an equation of motion which includes a suitable drag force (dependent on relative velocity) and an apparent mass force (proportional to relative acceleration). Dissert. Abstr.

N79-13297 Auburn Univ., Ala.
INTERACTION BETWEEN RADIATIVE AND CONVECTIVE HEAT TRANSFER IN A HYPERSONIC TURBULENT BOUNDARY LAYER ON A CIRCULAR CONE AT AN ANGLE OF ATTACK Ph.D. Thesis
Ganesh Nagabhushan Kumar 1978 272 p
Avail: Univ. Microfilms Order No. 7823193

Three different radiation formulations are used, namely: (1) optically thin limit approximation, (2) optically thick limit approximation for the optical thickness of the medium, and (3) two band approximation for the wavelength dependency of the properties of the medium. The resulting coupled integro-differential equations for the mass, momentum, and energy are solved using a marching implicit finite difference technique. The connective heat transfer to the wall increases by 40 to 100% and the total heat transfer to the wall increases five to thirty times that of the corresponding no radiation case for typical values of the radiative heat flux encountered for a missile flying near a fireball (external source of radiation). The axial and normal aerodynamic coefficients are also increased by about 5 to 20% due to the presence of the external radiation source. Dissert. Abstr.

N79-13298 Stanford Univ., Calif.
INVESTIGATION OF SEPARATION AND REATTACHMENT OF A TURBULENT SHEAR LAYER: FLOW OVER A BACKWARD-FACING STEP Ph.D. Thesis
Jeongbin John Kim 1978 230 p
Avail: Univ. Microfilms Order No. 7822526

Incompressible flow over a backward-facing step is studied in order to investigate flow characteristics in the separated shear layer, the reattachment zone, and the redeveloping boundary layer after reattachment. The boundary layer at separation is turbulent (Re sub theta = 1,300) and two different step-heights are used: HT/beta sub s = 2.2 and 3.3, where HT is the step-height and beta sub s is the boundary layer thickness at separation. The present study demonstrates the complex nature of the separation-reattachment process of a turbulent shear layer. Though the present work reveals several features of the flow, much more work will be required for complete understanding of it. Dissert. Abstr.

N79-13299 Polytechnic Inst. of New York.
DEFORMATION AND BREAKUP OF DROPLETS SUSPENDED IN ANOTHER LIQUID Ph.D. Thesis
Hong Bai Chin 1978 228 p
Avail: Univ. Microfilms Order No. 7816745

A theoretical analysis was carried out on the deformation of a droplet suspended in a steady extensional flow field, where both fluids may be represented by the second-order fluid model. The study took into account the effects of the viscosity, the elasticity and the interfacial tension of fluids concerned. The shape of a deformed droplet is determined theoretically by solving the equations of motion for both fluids, the droplet phase and suspending medium. A perturbation technique was employed to handle nonlinear terms appearing in the equations of motion, and an iteration method was used in determining the shape of the droplet undergoing extensional deformation. Series solutions of stream functions inside and outside the droplet, the pressure field around the droplet and the deformation of droplet were obtained. Dissert. Abstr.

N79-13300 Purdue Univ., Lafayette, Ind.
CONCENTRIC ANNULAR OIL-WATER FLOW Ph.D. Thesis
Michael Hugh Stein 1978 294 p
Avail: Univ. Microfilms Order No. 7821510

A picture of the annual flow of oil-water mixtures is developed by the formation of the volume-averaged, time-averaged equations of continuity and motion. For the case of isothermal, steady,

fully developed flow in horizontal pipes a velocity model was assumed. Expressions for apparent eddy viscosity and friction factor were subsequently derived. Experimental work included location of the transition points of the various flow regimes, and measurement of pressure gradient, oil concentration profile, and velocity profile. The transition points between flow regimes were used to construct a flow map. The pressure gradient data were used to find the unknown parameters in the velocity model. The velocity profile data were compared with the velocity model. Dissert. Abstr.

N79-13301 Illinois Univ. at Urbana-Champaign, Urbana.
AN EXPERIMENTAL STUDY OF NEAR-WALL TURBULENCE PROPERTIES IN HIGHLY DRAG REDUCED PIPE FLOWS OF PSEUDOPLASTIC POLYMER SOLUTIONS Ph.D. Thesis
Larry Gregg Chorn 1978 254 p
Avail: Univ. Microfilms Order No. 7820916

Research was conducted to assess the effect on near-wall turbulence properties for both intermediate levels of drag reduction and the region of the empirical maximum drag reduction asymptote. An electrochemical technique was used to measure the time-averaged and fluctuating components of the shear rate at the wall. Sucrose was used as a viscosity builder to increase the shear rate for a given flow rate, in this manner it was possible to achieve the maximum drag reduction region in a 2.6 cm pipe. In contrast to results in the literature it was possible to exceed the maximum drag reduction asymptote and approach the laminar friction factor relationship with polymer concentrations less than the critical concentration and solvent viscosities less than five centipoise. Dissert. Abstr.

N79-13302 Illinois Univ. at Urbana-Champaign, Urbana.
INVESTIGATION OF SEPARATED FLOW MODEL IN ANNULAR GAS-LIQUID TWO-PHASE FLOWS Ph.D. Thesis
John Clay Dallman 1978 212 p
Avail: Univ. Microfilms Order No. 7820922

A correlation for the fraction of liquid entrained in fully developed annular gas-liquid flow is obtained through the use of the approximate dynamic balance between the rate at which liquid is atomized from the wall layer, R sub A, and the rate of deposition of this liquid back to the wall layer, R sub D. From estimates in terms of R sub A a relation for R sub A is developed in terms of the gas density, gas velocity and the liquid film flow rate. Examination of these estimates and measurements of the onset of atomization indicate that for a given gas velocity R sub A becomes zero at nonzero liquid film flow rates. An entrainment correlation is developed using the relation developed for R sub A and a model for the rate of deposition. Dissert. Abstr.

N79-13303 Illinois Univ. at Urbana-Champaign, Urbana.
INTERPRETATION OF THE FLOW IN THE VISCOUS WALL REGION AS A DRIVEN FLOW Ph.D. Thesis
Dimitrios Theophylactos Hatziavramidis 1978 206 p
Avail: Univ. Microfilms Order No. 7820955

The problem of modelling the flow in the wall region has to do with modelling the Reynolds stresses in equations of motion. In a first attempt, the nonlinear Reynolds stress terms were neglected in the equations of motion and energy spectra of the three velocity components were calculated from the linearized equations. In a second attempt, the Reynolds stress terms were retained in the equations of motion. No assumption was made about these terms; instead, information about the structure of the flow from visual observations was incorporated in the model. The flow in the wall region is interpreted as a driven flow and the burst observed in visual studies is shown to be a result of the movement of shear layers from the region of coherent motions to the outer flow. Dissert. Abstr.

N79-13304*# Pittsburgh Energy Research Center, Pittsburgh.
THE DEVELOPMENT OF A THREE-DIMENSIONAL PARTIALLY ELLIPTIC FLOW COMPUTER PROGRAM FOR COMBUSTOR RESEARCH Final Report
Y. S. Pan Nov. 1978 53 p refs
(Contract NAS1-15046)
(NASA-CR-3057) Avail: NTIS HC A04/MF A01 CSCL 20D

A three dimensional, partially elliptic, computer program was developed. Without requiring three dimensional computer storage locations for all flow variables, the partially elliptic program is capable of predicting three dimensional combustor flow fields with large downstream effects. The program requires only slight increase of computer storage over the parabolic flow program from which it was developed. A finite difference formulation for a three dimensional, fully elliptic, turbulent, reacting, flow field was derived. Because of the negligible diffusion effects in the main flow direction in a supersonic combustor, the set of finite-difference equations can be reduced to a partially elliptic form. Only the pressure field was governed by an elliptic equation and requires three dimensional storage; all other dependent variables are governed by parabolic equations. A numerical procedure which combines a marching integration scheme with an iterative scheme for solving the elliptic pressure was adopted. B.B.

N79-13305*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CRITICAL STUDY OF HIGHER ORDER NUMERICAL METHODS FOR SOLVING THE BOUNDARY-LAYER EQUATIONS
Stephen F. Wornom Nov. 1978 55 p refs
(NASA-TP-1302; L-11860) Avail: NTIS HC A04/MF A01 CSCL 20D

A fourth order box method is presented for calculating numerical solutions to parabolic, partial differential equations in two variables or ordinary differential equations. The method, which is the natural extension of the second order box scheme to fourth order, was demonstrated with application to the incompressible, laminar and turbulent, boundary layer equations. The efficiency of the present method is compared with two point and three point higher order methods, namely, the Keller box scheme with Richardson extrapolation, the method of deferred corrections, a three point spline method, and a modified finite element method. For equivalent accuracy, numerical results show the present method to be more efficient than higher order methods for both laminar and turbulent flows. B.B.

N79-13306*# Cornell Univ., Ithaca, N. Y. Lab. of Atomic and Solid State Physics.
FERMI LIQUID VISCOSITY IN A FINITE GEOMETRY
J. E. Jaffe 1979 23 p refs
(Grants NGR-33-010-188; NSF DMR-77-18329)
(NASA-CR-157835) Avail: NTIS HC A02/MF A01 CSCL 20D

Forced flow of a Fermi liquid is studied for a cell geometry consisting of two planes with a separation on the order of mean free path. An approximate transport equation is used to derive an integral equation for the velocity profile, which is solved numerically. Results for the total flux through the cell, which determines the dissipation, are given as a function of the Knudsen number N (ratio of cell thickness to mean free path). Effects of specular reflection at the boundaries are considered. It is found that the dissipation has a minimum at N approximately equal to 1/2, and behaves linearly for N greater than or equal to 3. Implications for present experimentation are discussed. G.Y.

N79-13307# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
REGIONS AND TRANSITIONS OF NONSTATIONARY OBLIQUE SHOCK-WAVE DIFFRACTIONS IN PERFECT AND IMPERFECT GASES
G. Ben-Dor Aug. 1978 150 p refs Sponsored in part by Natl. Res. Council of Canada
(Grant AF-AFOSR-3303-77)
(UTIAS-232; CN-ISSN-0082-5255) Avail: NTIS HC A07/MF A01

The diffraction of shock waves in perfect and imperfect nitrogen and argon by sharp compressive corners was investigated analytically and experimentally. It is shown that seven shock-wave diffraction domains exist in nitrogen and six in argon. The domains consisted of the four well-known shock wave reflections: regular reflection, single Mach, and double-Mach reflections. All the transition boundaries between these regions were established analytically and substantiated by experimental results. Over 100 experiments were conducted in hypervelocity shock tube equipped with a 23 cm dia field of view Mach-Zehnder

interferometer equipped with a dual-frequency laser light source. It is shown that real gas effects have a significant influence on the size of the regions and their transition boundaries. Some comparison between steady and nonstationary reflections are made and discussed. Isopycnics as well as density distributions along the wedge surface are presented for the various diffraction processes and their differences and similarities are discussed. G.G.

N79-13308*# National Aeronautics and Space Administration, Washington, D. C.
STABILITY AND BIFURCATION OF EQUILIBRIUM OF A BODY CONTAINING A LIQUID
V. A. Samsonov Dec. 1978 87 p refs Transl. into ENGLISH from Moscow State Univ. Inst. of Mech. Sci. Trans. (Moscow), no. 16, 1971 p 1-55 Transl. by Al Ahram Center for Sci. Transl., Cairo
(Contract NSF C-984)
(NASA-TT-F-17153; TT-78-59044) Avail: NTIS HC A05/MF A01 CSCL 20D

Taking the physical pendulum as an example, it is shown how the evolution of bifurcation and change of stability of different equilibrium positions occur. A series of problems is given about the stability of equilibrium as stationary motion of a vessel with capillary liquid. The aim of each example is to introduce some new mechanical property, introduced into the problem by surface force. Different definitions of stability equilibrium and stationary movement of a body with a liquid are discussed and compared, which reflect the specific case of one or the other problem. G.Y.

N79-13309# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistics Research Lab.
THE APPLICATION OF A HIGHLY PERMEABLE MEDIUM TO REDUCE SPIN-UP TIME AND TO STABILIZE A LIQUID-FILLED SHELL Final Report
W. P. Damico and A. Mark Jul. 1978 36 p refs
(AD-A058595; AD-E430098; ARBRL-MR-02851) Avail: NTIS HC A03/MF A01 CSCL 19/1

Laboratory experiments and projectile flight tests describe a technique that can reduce the spin-up time of a liquid contained within a cylinder. When the end wall regions of a cylinder are lined with a highly permeable material, the secondary circulation that controls the spin-up process is greatly enhanced, and a reduction in the spin-up time is achieved. Since the time to spin-up is decreased, then the time during which a liquid-induced instability could act is also decreased. Author (GRA)

N79-13310# Naval Ship Research and Development Center, Bethesda, Md.
BOUNDARY-FITTED COORDINATE SYSTEMS FOR THREE-DIMENSIONAL REGIONS CONTAINING SHIP-LIKE BODIES Interim Report, Oct. 1977 - Apr. 1978
Roderick M. Coleman Sep. 1978 24 p refs
(SR0140301)
(AD-A058897; DTNSRDC-78/085) Avail: NTIS HC A02/MF A01 CSCL 20/4

A method for numerically generating boundary-fitted coordinate systems for three-dimensional regions containing ship-like bodies is the subject of this report. This procedure involves a transformation which maps the region of interest in physical space onto a region in computational space where a uniform grid is defined. The result is a curvilinear coordinate system in the physical region having coordinate lines coincident with all boundary contours. GRA

N79-13311# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
A DISCUSSION OF BOUNDARY-FITTED COORDINATE SYSTEMS AND THEIR APPLICABILITY TO THE NUMERICAL MODELING OF HYDRAULIC PROBLEMS Final Report, Oct. 1977 - Jun. 1978
Billy Harvey Johnson and Joe F. Thompson Sep. 1978 79 p refs
(DA Proj. 4A0-61101-A-91D)
(AD-A059192; WES-MP-H-78-9) Avail: NTIS HC A05/MF A01 CSCL 20/4

A procedure for the numerical solution of nonorthogonal boundary-fitted coordinate systems, i.e., a coordinate line coincides with the boundary, is presented. This method generates curvilinear coordinates as the solution of two elliptic partial differential equations with Dirichlet boundary conditions, one coordinate being specified to be constant on each of the boundaries, and a distribution of the other specified along the boundaries. No restrictions are placed on the irregularity of the boundaries, which are even allowed to be time dependent, such as might occur in problems involving the computation of the location of the free surface, flooding boundaries, and streambank erosion problems. In addition, fields containing multiple bodies or branches can be handled as easily as simple geometries. Regardless of the shape and number of bodies and regardless of the spacing of the curvilinear coordinate lines, all numerical computations, both to generate the coordinate system and to subsequently solve the system of partial differential equations of interest, e.g., the vertically integrated hydrodynamic equations, are done on a rectangular grid with square mesh. GRA

N79-13312# Cincinnati Univ., Ohio. Dept. of Mechanical Engineering.
STUDY OF REYNOLDS STRESS EQUATION FOR PREDICTION OF FLOW CHARACTERISTICS OF FREE JET Final Report, 1 Jul. 1977 - 30 Jun. 1978
Y. G. Tsuei Aug. 1978 43 p refs
(Grant AF-AFOSR-3311-77)
(AD-A058942; AFOSR-78-1268TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

This report concerns the prediction of the flow characteristics of an isothermal free jet. A computer program has been developed. Reynolds stress equations are used so that not only turbulent shearing stress, but also turbulent kinetic energy and dissipation can be calculated. This program is rather short, about 280 statements, and for a moderate number of points (usually about 15), requires only five seconds per run for the Amdahl 470/V6 computer. The results compare fairly well with experiments in two-dimensional as well as in axi-symmetric jets. It is found that the similarity assumption is only approximate. Also, the results can be somewhat different for different initial input turbulence conditions. Therefore, comparison of experimental results and interpretation of their accuracy, particularly when no detailed measurements are made at the jet orifice, should be done cautiously. The variations due to the assigned constants in the closure model are also briefly discussed. GRA

N79-13313# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
AN EXPERIMENTAL INVESTIGATION OF METHODS TO INCREASE THE LIQUID JET PENETRATION INTO SUPERSONIC FLOW Interim Report
S. I. Baranovsky and J. A. Schetz Jun. 1978 69 p refs
(Grant AF-AFOSR-3485-78; AF Proj. 2308)
(AD-A059205; VPI-AERO-083; AFOSR-78-1300TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

The main aim of this experimental work was a detailed study of the influence of injection angle on the penetration and break-up of liquid fuel jets in a supersonic air stream. A particular goal was to incorporate that variable into the penetration correlations previously developed at VPI. This was accomplished. A secondary aim of the work was to assess the performance of liquid fuel jet injection from the top of a slender strut that protrudes out into the flow. This is one method that has been suggested for the (mechanical) enhancement of penetration. The penetration behavior was found to be similar to that associated with injection from a flat plate. A result of particular interest was the discovery of waves with amazingly sharp crests on the windward side of the jets for downstream angled injection. GRA

N79-13314# Hebrew Univ., Jerusalem (Israel).
THE DYNAMICS OF NONSPHERICAL PARTICLES. 4: DEPOSITION OF FLOW Final Technical Report, Nov. 1976 - Apr. 1978
Isaiah Gallily Apr. 1978 59 p refs
(Grant DA-ERO-76-G-014; DA Proj. 1T1-61102-BH-57)
(AD-A059088) Avail: NTIS HC A04/MF A01 CSCL 20/4

The gravitational deposition of axisymmetrical elongated particles from a laminar flow was studied theoretically and checked experimentally. The rotation of the particles due to the velocity

gradients was taken into account. The dependence of the sedimentation characteristics on the initial conditions of motion, the geometric dimensions of the particles and the flow, was investigated. It has been found that the Stokes (or Aerodynamic) Diameter of the particles is not an inherent property but rather a function of the velocity gradients within the flow. This is thought to be significant for the size assessment of nonspherical aerosol particles and its interpretation. Author (GRA)

N79-13315# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
SECONDARY INSTABILITY IN BOUNDARY-LAYER FLOWS
Ali H. Nayfeh and Ali N. Bozatli Aug. 1978 35 p refs
(Contract N00014-75-C-9381)
(AD-A058804; VPI-E-78-19) Avail: NTIS HC A03/MF A01 CSCL 20/4

The stability of a secondary Tollmien-Schlichting wave, whose wavenumber and frequency are nearly one half of those of a fundamental Tollmien-Schlichting instability wave (T-S wave), is analyzed by using the method of multiples. Under these conditions, the fundamental wave acts as a parametric excitor for the secondary wave. When the amplitude of the fundamental wave is small, the amplitude of the secondary wave deviates slowly from its unexcited state. However, as the amplitude of the fundamental wave increases, so does the amplitude of the secondary wave even in the regions where it is damped in the unexcited state. Author (GRA)

N79-13316# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN IMPLICIT FINITE DIFFERENCE PROCEDURE FOR THE LAMINAR, SUPERSONIC BASE FLOW Ph.D. Thesis - Georgia Inst. of Tech., Dec. 1977
Robert Landon Roach 1978 136 p refs
(AD-A058411; AFIT-CI-78-71) Avail: NTIS HC A07/MF A01 CSCL 20/4

The development of a tool for solving the near field of a scramjet fuel injector was attacked by first developing a numerical technique for solving the laminar, supersonic near wake flow. It was considered important to develop a procedure that had a potential for reduced computation time compared with explicit methods. The implicit numerical procedure was extended to mixed subsonic/supersonic flow with shocks, expansions, and regions of reverse flow. In the present case, numerical results have been obtained for the laminar, supersonic near wake behind a rectangular base. This numerical method produced stable, convergent, and accurate solutions when applied to this complex flow problem. GRA

N79-13317# Naval Ship Research and Development Center, Bethesda, Md.
AUTOROTATION OF PLATES Final Report
Hans J. Lugt Aug. 1978 114 p refs
(WR0230203; SR0140301)
(AD-A058338; DTNSRDC-78/058) Avail: NTIS HC A06/MF A01 CSCL 20/4

The autorotation of plates normal to a uniform parallel flow is explained in detail for low Reynolds numbers by means of numerical solutions of the Navier-Stokes equations. The incompressible fluid flow is assumed to be laminar and two-dimensional. Comparisons are made with high Reynolds number and three-dimensional flows. The article defines autorotation, gives an historical account of investigations into autorotation, and shows that autorotation is caused by a complicated interplay of vortex shedding, boundary-layer hysteresis, and vorticity generation around the edges of the plate. Author (GRA)

N79-13318# California Univ., Berkeley. Dept. of Mechanical Engineering.
ON THE ONSET OF BREAKUP IN INVISCID AND VISCOUS JETS
D. A. Caulk and P. M. Naghdi Jul. 1978 30 p refs
(Contract N00014-76-C-0474; NR Proj. 062-534)
(AD-A058689; UCB/AM-78-3) Avail: NTIS HC A03/MF A01 CSCL 20/4

This paper is concerned with the instability of inviscid and viscous jets utilizing the basic equations of the one-dimensional direct theory of a fluid jet based on the concept of a Cosserat (or a directed) curve. First, a system of differential equations is derived for small motions superposed on uniform flow of an inviscid straight circular jet which can twist along its axis. Periodic wave solutions are then obtained for this system of linear equations; and, with reference to a description of growth in the unstable mode, the comparison of the resulting dispersion relation is found to agree extremely well with the classical (three-dimensional) results of Rayleigh. Next, constitutive equations are obtained for a viscous elliptical jet and these are used to discuss both the symmetric and the anti-symmetric small disturbances in the shape of the free surface of a circular jet. Through a comparison with available three-dimensional numerical results, the solution obtained is shown to be an improvement over an existing approximate solution of the problem.
Author (GRA)

N79-13319# Air Force Academy, Colo. Research Lab.
UNSTEADY BOUNDARY LAYER FLOW REVERSAL IN A LONGITUDINALLY OSCILLATING FLOW Final Report, Aug. 1975 - Aug. 1978
John P. Retelle, Jr. Aug. 1978 140 p refs
(AF Proj. 2307)
(AD-A058714; FJSRL-TR-78-0006) Avail: NTIS HC A07/MF A01 CSCL 20/4

Measurements of boundary layer flow reversal made in a wind tunnel on a stationary NACA 0012 airfoil immersed in a longitudinally oscillating subsonic flow are described. A split-film sensor provided flow reversal data in regions above the airfoil surface throughout the period of flow oscillation. At angles of attack below the steady-flow stall angle of attack and for small amplitude oscillations, regions of boundary layer flow reversal near the leading edge were observed to vary nominally in phase with e time-varying external velocity. However, an increase in the oscillation amplitude produced a phase lead and an increased downstream extent of the flow reversal region. It is shown that boundary layer flow reversal on a stationary airfoil in an oscillating free stream responds to changes in the flow unsteadiness in a manner similar to the flow reversal observed during the onset of dynamic stall on an airfoil oscillating in pitch. GRA

N79-13320# Brookhaven National Lab., Upton, N. Y.
LUMPED-PARAMETER MODELING OF ONE-DIMENSIONAL TWO-PHASE FLOW
Wolfgang Wulff 1978 29 p refs Presented at Meeting on Transient Two-Phase Flow, Paris, 12 Jun. 1978
(Contract EY-76-C-0016)
(BNL-24483; Conf-780659-1) Avail: NTIS HC A03/MF A01

An integral or lumped parameter modeling technique is presented for the analysis of nonequilibrium, nonhomogeneous, one dimensional two phase flow. The method is designed to increase computing efficiency over standard finite difference techniques and to describe accurately the motion of flow regime interfaces. Computing efficiency is achieved by converting the partial differential equations of the conservation laws into ordinary differential equations and by introducing profile estimates. Flow regime interfaces are tracked with the aid of kinematic jump conditions. The governing equations are derived, and the method is elucidated on three applications. One application involves a closed-loop transient, the second one involves the dynamics of a liquid level, while the third application deals with the level swelling above a nonhomogeneous two phase mixture. Comparisons are presented between lumped parameter modeling solutions, solutions from finite difference techniques, and analytical solutions. DOE

N79-13321# Brookhaven National Lab., Upton, N. Y.
OPTICAL PROBE FOR LOCAL VOID FRACTION AND INTERFACE VELOCITY MEASUREMENTS
N. Abuaf, O. C. Jones, Jr., and G. A. Zimmer Mar. 1978 22 p refs
(Contract EY-76-C-02-0016)
(BNL-NUREG-50791) Avail: NTIS HC A02/MF A01

In view of the importance of obtaining unsteady local void fraction and interface velocities in liquid-vapor two phase flows, an optical probe with a controlled tip geometry was developed and is described. In order to minimize the disturbances caused to the flow field by the presence of the probe, its dimensions

were miniaturized. The electronic and hydrodynamic response of the probe were investigated experimentally. The probe was found to be sensitive to both the interface velocities and the phase present at the probe tip. A possible explanation for the behavior of the probe is presented. Within the velocity range checked and with proper calibration, the optical probe developed can be used to determine both local void fractions and interface velocities. DOE

N79-13322# Battelle Pacific Northwest Labs., Richland, Wash.
PRELIMINARY RESULTS OF A FIELD EXPERIMENT TO CHARACTERIZE WIND FLOW THROUGH A VERTICAL PLANE
M. Gary Verholek Apr. 1978 42 p
(Contract EY-76-C-06-1830)
(PNL-2518) Avail: NTIS HC A03/MF A01

Preliminary results are presented of a field experiment to study the turbulent structure in the wind flow through a simulated disc of rotation of a large, horizontal-axis wind turbine blade. The wind flow impinging on the hypothetical turbine blade was simulated by a nine-element circular array of three component anemometers in a single vertical plane. The wind data were analyzed as: a single point, hub height measurement (at the center of the array); an arithmetic average of all sensors; and a synthesis of the data records assumed to represent measurement locations on a hypothetical, rotating turbine blade. The effects of areal averaging were examined using the arithmetic mean over the array. Similarly, the effects of averaging over the blade pair were examined by arithmetically averaging opposing data points representing the air flow past the rotating blade. DOE

N79-13323# Los Alamos Scientific Lab., N. Mex.
ONE-DIMENSIONAL CALCULATION OF FLOW BRANCHING USING THE METHOD OF CHARACTERISTICS
R. W. Meiser and R. G. Gido May 1978 20 p refs
(Contract W-7405-eng-26)
(LA-7306-MS; NUREG/CR-0064) Avail: NTIS HC A02/MF A01

In one-dimensional flow systems, the flow often branches, such as at a tee or manifold. A formulation for calculating the flow through branch points with one-dimensional method of characteristics equations was developed. The resultant equations were verified by comparison with experimental measurements. DOE

N79-13324# National Technical Information Service, Springfield, Va.
SHEAR FLOW. PART 1: LIQUIDS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1978
Guy E. Habercom, Jr. Oct. 1978 209 p Supersedes NTIS/PS-77/1037; NTIS/PS-76/0935; NTIS/PS-75/819 3 Vol.
(NTIS/PS-78/1160/7; NTIS/PS-77/1037; NTIS/PS-76/0935; NTIS/PS-75/819) Avail: NTIS HC $28.00/MF $28.00 CSCL 20D

Shear flow and stresses are studied for a number of liquids such as water, lubricants, polymers, liquified gases, and liquid metals. The studies relate to hydrodynamics, elastohydrodynamics, magnetohydrodynamics, fluerics, rheology, acoustics, and oceanology. Theoretical aspects, mathematical models, equations of motion, computer programs, measurement technology, and empirical relationships are included. This updated bibliography contains 202 abstracts, 10 of which are new entries to the previous edition. GRA

N79-13325# National Technical Information Service, Springfield, Va.
SHEAR FLOW. PART 3: GENERAL STUDIES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1965 - Sep. 1978
Guy E. Habercom, Jr. Nov. 1978 272 p Supersedes NTIS/PS-77/039; NTIS/PS-761/0937; NTIS/PS-75/822 3 Vol.
(NTIS/PS-78/1162/3; NTIS/PS-77/039; NTIS/PS-76/0937; NTIS/PS-75/822) Avail: NTIS HC $28.00/MF $28.00 CSCL 20D

General aspects of fluid shear in laminar and turbulent flow are discussed. Topics covered include: boundary layer dynamics, layers, stratified flow, stresses, ducts, pipes, channels, mixing, bursts, magnetohydrodynamics, viscosity, oscillation, and flow separation and reattachment. Wind tunnel modeling and flat plate characteristics are described, including mathematical models, computerized simulation, theory equations of motion, anemometry, numerical analysis, and stability. Data are given on wall flow, wake, heat transfer, pressure gradients, and similar topics. This updated bibliography contains 265 abstracts, 30 of which are new entries to the previous edition. GRA

N79-13326# National Technical Information Service, Springfield, Va.
SHEAR FLOW. PART 2: GASES, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progess Report, 1970 - Sep. 1978
Guy E. Habercom, Jr. Nov. 1978 277 p Supersedes NTIS/PS-77/1038; NTIS/PS-761/0936; NTIS/PS-75/821 3 Vol.
(NTIS/PS-78/1161/5; NTIS/PS-77/1038; NTIS/PS-76/0936; NTIS/PS-75/821) Avail: NTIS HC $28.00/MF $28.00 CSCL 20D

Reports related to shear flow in gases including air, exhausts, lasers, and plasmas are cited. Characteristics are discussed involving boundary layer dynamics; shock waves, turbulent flow and mixing; stratification; wake; wind tunnel testing; subsonic, transonic, supersonic, and hypersonic flow; geometric configurations; magnus force; turbine blades, airfoils, and airframes; and magnetohydrodynamics. Some reference is made to flow separation and reattachment. Model tests, jets, channel flow, and additional topics are discussed. This updated bibliography contains 271 abstracts, 34 of which are new entries to the previous edition. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N79-13327 California Univ., Santa Barbara.
SPARSE SENSOR ARRAYS Ph.D. Thesis
Charles Richard Greene 1978 276 p
Avail: Univ. Microfilms Order No. 7824178

Sensors that do not form a unique spacing/orientation pair with at least one other sensor are themselves redundant. Omission of redundant sensors forms a sparse array. Omitted terms in array output were replaced by substituting equivalent terms from the remaining sensors. When more than one equivalent term was available for substitution, a linear combination of terms was optimized for minimum output variance. In this way the expected gain and directivity of the sparse array were made identical to those parameters for the full array. The loss of sensors was manifested generally by an increase in the output variability for finite averaging times. The variability was analyzed for specific array geometries operating in specified noise fields by comparing the array output variances for zero time averaging. Linear arrays with four, five, seven, and 10 equispaced sensors were compared with corresponding sparse arrays having three, four, and five sensors. Dissert. Abstr.

N79-13328 Michigan Univ., Ann Arbor.
MEASUREMENTS OF THERMAL CONDUCTIVITIES OF GASES AT HIGH TEMPERATURES AND AT HIGH PRESSURES Ph.D. Thesis
Mehesh Chand Aggarwal 1978 193 p
Avail: Univ. Microfilms Order No. 7822845

An experimental apparatus was designed, built, and tested for measuring the thermal conductivities of gases in the temperature range 350 to 1500 K and in the pressure range 0.1 to 150 MPa. The thermal conductivities were determined from measurements of the heat loss from a filament suspended

concentrically inside a vertical cylinder. Two columns of different length were used in order to minimize end effects. A comparison made between the thermal conductivities of argon, ethylene, and propane obtained in the investigation and those reported in the literature indicated a good agreement. For argon only, the values of the thermal conductivity obtained in these experiments were also compared to the values obtained by kinetic theory. The agreement was found to be within 0.4 percent at 0.1 MPa and 1.4 percent at higher pressures. Dissert. Abstr.

N79-13329# Hughes Research Labs., Malibu, Calif.
ELECTRONIC COOLING OF RESONANT GRAVITY GRADIOMETERS
Robert L. Forward Mar. 1978 25 p refs
(RR-516) Avail: NTIS HC A02/MF A01

Electronic cooling is a technique where electronic circuits are coupled to a sensor through two-way transducers to improve the sensor S/N ratio by reducing the effects of thermal noise on the sensor. The technique is applied to the mechanically resonant Hughes Rotating Gravity Gradiometer (RGG). The general concept is equally applicable to nonresonant, nonmechanical sensors, such as IR and microwave sensors. Electronic cooling techniques are used to obtain and 8.3 db improvement in the S/N ratio of an existing RGG sensing structure. In newer designs of the RGG the improvement is expected to increase to 20 db. This improvement in S/N ratio can be used to decrease the thermal-noise-limited sensitivity of the RGG from 0.3 to 0.03 Eotvos, decrease its response time from 10 to 1 sec, or decrease its dimension by an order of magnitude (or various combinations of the above). G.Y.

N79-13330# Case Western Reserve Univ., Cleveland, Ohio. School of Engineering.
THEORY AND CONSTRUCTION OF TIME RESOLVED X-RAY SPECTROMETER Final Technical Report, 31 Jan. 1975 - 31 Jan. 1978
O. K. Mawardi, C. Speck, R. Vesel, and A. Ferendeci Aug. 1978 95 p refs
(Grant AF-AFOSR-2806-75; AF Proj. 2301)
(AD-A059034; AFOSR-78-1269TR) Avail: NTIS HC A05/MF A01 CSCL 14/2

This report describes the essential characteristics of a time resolved X-ray spectrometer. The spectrometer uses a convex curved LiF crystal which diffracts the X-rays onto a plastic (NE 102) scintillator. The spectrometer is capable of analyzing spectra in the range of 4.2 KeV to 12.4 KeV. It can also time resolve the observed spectra to approximately 2.4 micro sec. with a wavelength discrimination better than 4%. The report also contains the calculations, design and calibration of the associated electronics for the detection of the optical signal which appears at the plastic scintillator. A video storage system detects and stores the signal from the spectrometer. The unfolding of the x-ray spectra can then be performed at a much slower rate. The optical detector consists of a WX-31381 vidicon tube. GRA

N79-13331# Regis Coll., Weston, Mass.
AN INITIAL STUDY OF POWER SPECTRA FROM SATELLITE IMAGERY
Ronald F. Fournier 30 Sep. 1978 35 p refs
(Contract F19628-77-C-0010; AF Proj. 2310)
(AD-A058483; AFGL-TR-77-0295; SR-2) Avail: NTIS HC A03/MF A01 CSCL 04/2

Air Force Global Weather Center (AFGWC) routinely generates a global cloud analysis called 3-D Nephanalysis (3-D Neph). At 15 levels in the atmosphere and for 25-mile square boxes, the cloud field is defined as clearly as possible with available data. All modes of data (surface, radiosonde, aircraft and satellite), are pre-processed and used prior to utilization by 3-D Neph by means of a decision tree process. This report reviews briefly the current approach at AFGWC, and the proposed method of processing increased amounts of data with a higher level of sophistication and greater efficiency. Author (GRA)

N79-13332# Farrand Optical Co., Inc., Valhalla, N.Y.
HOLOGRAPHIC VOLUME PHASE, 17-INCH APERTURE, ON-AXIS, SPHERICAL BEAMSPLITTER MIRROR: DEVELOPMENT OF Final Report, 1 Dec. 1975 - 1 Mar. 1977
Brooks AFB, Tex. AFHRL Aug. 1978 47 p
(Contract F33615-76-C-0041; AF Proj. 1958)
(AD-A058339; AFHRL-TR-78-29) Avail: NTIS HC A03/MF A01 CSCL 20/6

This project was to develop a holographic, spherical beamsplitter mirror, utilizing a high power continuous wave laser. The holographic beamsplitter mirror would be used in a Pancake Window system, replacing the classical beamsplitter mirror which is expensive to manufacture and is the heaviest element. Techniques that were investigated involved the handling of high power lasers; a two-room, two-table geometry configuration; and other lesser problems, such as vibration, thermal, accoustic, and ghosts. A 17-inch aperture, holographic volume-phase, on-axis, spherical beamsplitter mirror was developed and tested in a holographic Pancake Window system. Its overall performance was not yet as good as a classical Pancake Window system, but results at certain angles were better than theoretically could be expected. It was recommended that development be continued in order to resolve problems encountered during this project and to develop a larger size holographic spherical beamsplitter mirror. Author (GRA)

N79-13333# Singer-Kearfott, Fairfield, N. J. Kearfott Div.
ANGULAR RATE SENSOR PROGRAM Final Report, Apr. - Dec. 1977
J. L. Evans and R. E. Weber Dec. 1977 53 p
(Contract DNA001-77-C-0140)
(AD-A058362; AD-E300298) Avail: NTIS HC A04/MF A01 CSCL 14/2

The purpose of this project was to evaluate the technology associated with the Kearfott Angular Rate Sensor (KARS) and to verify that it was at a level of development such that a production version could be begun. The four phases of the effort were: (1) analysis of operational requirements and their impact on the design; (2) perform design analysis for a design chosen to satisfy the specific set of requirements arrived at; (3) define test requirements and data reduction techniques appropriate to the design and the application; and (4) perform various critical subassembly tests. These steps were completed satisfactorily. The following major tasks were also completed: A configuration of the KARS satisfying the requirements as set forth by DNA was analyzed and found to be satisfactory; A test program was defined and a data reduction technique was analyzed; and various critical subassemblies were built and tested. The results of these tests verified the ability of the design to meet the environmental and performance requirements in the specification. GRA

N79-13334# Ampex Corp., Redwood City, Calif. Advanced Technology Div.
FOIL BEARING INVESTIGATION. A FOIL BEARING MODEL FOR HIGH SPEED ROTATING MAGNETIC HEAD
A. Eshel and T. G. Kennedy 29 Aug. 1978 24 p refs
(Contract N00014-77-C-0021)
(AD-A058451; RR-78-10) Avail: NTIS HC A02/MF A01 CSCL 14/3

A quasi one-dimensional foil bearing model for high speed rotating magnetic heads has been formulated. Side flow is smeared as a leakage factor. Steady state foil inertia effects are included. The effects of head protrusion side leakage factor as well as speed parameter are discussed. Of particular interest is the effect of rotational speed in relation to the propagation speed of transverse waves in the foil. Author (GRA)

N79-13335# Sandia Labs., Livermore, Calif.
DIGITAL ANGULAR POSITION INDICATOR
J. Hopwood Jun. 1978 22 p
(Contract EY-76-C-04-0789)
(SAND-78-8014) Avail: NTIS HC A02/MF A01

An instrument is described which tracks and digitally displays, with an accuracy of 1 arc/minute, the rotation in degrees and minutes of a 36-inch rotary table used for inspection measurement of mechanical parts. A motor and control, which facilitates positioning of the rotary table, were also considered. DOE

N79-13336# Research Triangle Inst., Research Triangle Park, N. C.
USE OF THE FLAME PHOTOMETRIC DETECTOR METHOD FOR MEASUREMENT OF SULFUR DIOXIDE IN AMBIENT

AIR. A TECHNICAL ASSISTANCE DOCUMENT Final Report, Sep. 1976 - May 1978
W. Cary Eaton May 1978 159 p refs
(Contract EPA-68-02-2433)
(PB-285171/5; EPA-600/4-78-024) Avail: NTIS HC A08/MF A01 CSCL 14B

This technical assistance document is intended to serve as a source-book of information and outlines of good practice for operation and calibration of ambient air SO2 detection analyzers based on the measurement principle of Flame Photometric Detection (FPD). This is accomplished through the identification and control of critical parameters affecting the operation and calibration of FPD analyzers. The document may be used with analyzers which measure total sulfur, as well as with new SO2 specific models which have been designated as equivalent methods by EPA. Topics covered include: installation and startup of the analyzer; calibration sources and their air supplies; procedures for multipoint dynamic calibration; and procedural aids. GRA

N79-13337# Battelle Columbus Labs., Ohio.
FABRICATION, OPTIMIZATION, AND EVALUATION OF A MASSIVE VOLUME AIR SAMPLER OF SIZED RESPIRABLE PARTICULATE MATTER Final Report
R. I. Mitchell, W. M. Henry, and N. C. Henderson Jun. 1978 137 p
(Contract EPA-68-02-2281)
(PB-285375/2; EPA-600/4-78-031) Avail: NTIS HC A07/MF A01 CSCL 14B

A prototype sampler which collects airborne particulate matter in three stages, 3.5 micrometers, 1.7 micrometers, and below 1.7 micrometers was constructed. Component failures and operational difficulties of the prototype were reviewed, and improvements made. The improvements consisted primarily of design modification and changes in the materials of construction to provide for better strength, durability, and to insure unattended operation and ease of maintenance. The re-designed samplers were tested experimentally. GRA

N79-13338# California Univ., Livermore. Lawrence Livermore Lab.
INTERCOMPARISON OF SAMPLERS USED IN THE DETERMINATION OF AEROSOL COMPOSITION Final Report
David C. Camp, Allan L. Van Lehn, and Billy W. Loo (LBL) Jul. 1978 152 p refs Prepared in cooperation with DOE, Wash., D.C.
(PB-285419/8; EPA-600/7-78-118) Avail: NTIS HC A08/MF A01 CSCL 14B

The performance of 11 different designs of aerosol samplers was evaluated. The collected samples were returned to the laboratory of each participant and analyzed for mass, nitrate, sulfur or sulfate, lead, and 9 other elements. Best agreement among samplers was found for elements such as sulfur and lead that occurred primarily in the fine fraction. For stacked filter samplers and the tandem filter samplers, the fine fraction appeared to be enriched with crustal elements such as Si, Ca, and Fe, which suggests that there are particle bounce errors. Of all the samplers tested the automatic dichotomous sampler showed the greatest precision. GRA

N79-13339# National Bureau of Standards, Washington, D. C. Fluid Engineering Div.
LOW VELOCITY PERFORMANCE OF A BALL BEARING VANE ANEMOMETER Task Report, 1 Feb. 1977 - 31 Mar. 1977
L. P. Purtell Jun. 1978 21 p
(PB-284864/6; NBSIR-78-1485) Avail: NTIS HC A02/MF A01 CSCL 14B

Performance of a ball bearing vane anemometer was evaluated over the speed range of 23 to 724 feet per minute including starting speed and stopping speed. The tests were performed in the NBS Low Velocity Airflow Facility which provides a uniform flow of low turbulence and utilizes a laser velocimeter as the velocity standard. GRA

N79-13340# National Bureau of Standards, Washington, D. C.
THE NICROSIL VERSUS NISIL THERMOCOUPLE: PROPERTIES AND THERMOELECTRIC REFERENCE DATA Final Report
Noel A. Burley, Robert L. Powell, George W. Burns, and Margaret G. Scroger Apr. 1978 171 p Sponsored in part by Materials Res. Labs., Maribyrnong (Australia)
(PB-284976/8; NBS-MONO-161) Avail: NTIS HC A08/MF A01 CSCL 14B

In the formulation of the new alloys, the main method was to use basic thermodynamic data to predict the conditions of solute concentration, temperature and oxygen pressure under which certain discrete oxide layers could form on the surface as highly efficacious passivating films. This work was the culmination of extensive research in which thermoelectric instability in existing nickel-base thermocouple alloys was correlated with their physical, chemical and metallurgical properties. The basic thermoelectric properties of Nicrosil and Nisil were the subject of a joint research project between NBS and MRL. The aim of this project was to establish a body of standard reference data on the thermoelectric and other properties of the new thermocouple alloys which could be recognized by various standards authorities around the world. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N79-13341 Tennessee Univ., Knoxville.
CYCLOTRON MASER INSTABILITY IN A NONLINEAR ELECTROSTATIC FIELD Ph.D. Thesis
Larry Roger Barnett 1978 107 p
Avail: Univ. Microfilms Order No. 7823306

An electron cyclotron maser instability was studied which was found to exist when a strong spatially nonlinear static electric field is applied to a system of electrons in cyclotron motion. This is a fast-wave amplification mechanism thus allowing the use of ordinary and overmoded waveguides or cavity resonators. The cyclotron maser was studied theoretically for a general form of the nonlinear electrostatic field, and a method was formulated to readily allow calculation of the energy dependent resonance frequency of the electrons for a particular field configuration. By the nonisochronism created, phase bunching can be predicted and conditions were found for the amplification of microwaves. The calculations show that the instability exists even for very low energy electrons of only a few-electron volts. An experiment demonstrated the instability to a reasonable agreement with the theory. Dissert. Abstr.

N79-13342 Utah Univ., Salt Lake City.
CHARACTERISTICS OF A DISTRIBUTED FEEDBACK CARBON DIOXIDE LASER Ph.D. Thesis
Ronald Otis Miles 1978 160 p
Avail: Univ. Microfilms Order No. 7822819

Using a plane wave analysis and perturbation theory, the characteristics of a hollow-core distributed feedback CO2 laser are derived. Expressions for two dimensional fields supported in a rectangular hollow-core dielectric waveguide are developed. Expressions for TE and TM leaky mode loss are also derived. Coupling coefficients for backward scattering modes coupling to the forward incident mode are derived. A double-grating slab waveguide is analyzed where both dielectric interfaces contain identical sinusoidal perturbations. Expressions for waveguide reflectivity are derived in terms of relative phase or position of the two gratings. Construction of a distributed feedback CO2 laser is reported. A method of external discharge pumping to create an active medium in a 76 microns waveguide is discussed. Dissert. Abstr.

N79-13343 Washington Univ., Seattle.
BLACKBODY OPTICAL PUMPING OF CARBON DIOXIDE LASER MIXTURES Ph.D. Thesis
Oktay Yesil 1978 180 p
Avail: Univ. Microfilms Order No. 7820789

The concept of blackbody radiation pumping of CO2 laser mixtures as a step toward utilization of solar radiation as a pumping source is illustrated. An attractive method whereby solar energy can be converted to laser energy very efficiently is to use an intermediate blackbody cavity. An experiment was

performed in which laser gas mixtures were exposed to intense thermal radiation for brief periods of time. Gain has been measured at 10.6 microns in a CO2-He gas mixture. The gas mixture at a temperature of 400 K with pressures on the order of 1 torr is enclosed in a sapphire tube and pumped by blackbody radiation. An electrically heated oven in the temperature range of 1500 K supplies the radiation. A CW CO2 probe laser is used to detect the optical gain. A simplified model is used to describe the rate of change of energy of the vibrational modes of CO2.
Dissert. Abstr.

N79-13344# Hughes Research Labs., Malibu, Calif.
STUDY OF SURFACE FINISHING AND COATING OF DF LASER WINDOWS Final Technical Report, 1 Jun. 1977 - 30 Jun. 1978
J. A. Harrington and M. Braunstein Aug. 1978 34 p refs
(Contract N00014-75-C-0891)
(AD-A058999) Avail: NTIS HC A03/MF A01 CSCL 20/5

This report summarizes a three-year investigation into the absorption losses in thin film coatings and surfaces of highly transparent materials at 3.8 microns. The primary emphasis during the first two years was on the minimization of thin film coating losses with the result that it is now possible to achieve film absorptions at DF laser wavelengths of nearly 0.01%/surface. In addition, attenuated total reflection studies performed in cooperation with the Naval Research Laboratory yielded information on the nature and cause of surface absorption in highly transparent coatings and bulk materials. The majority of this report is devoted to additional studies on surface absorption and methods that might be used to harden the surfaces of transparent materials. Surface absorption was measured in KCl and CaF2 that had been selectively contaminated by either H2O, D2O, C2H5OH, CH3OH, or NH4OH. Although increases in surface absorption of as much as 100% resulted for hydrocarbon contamination, a smaller increase than expected resulted for H2O and D2O contamination. The surface hardening experiments involved measuring delayed failure in coated (Al2O3) and uncoated SrF2 and CaF2 substrates. No definitive conclusions could be drawn regarding these results because the starting static loads were too high. All the tests were not completed.
GRA

N79-13345# Wisconsin Univ. - Madison.
INFRARED EMISSION AND SCATTERING FROM THE DENSE PLASMA FOCUS Final Report, 15 Jan. 1977 14 Jan. 1978
George R. Neil and Richard S. Post Jun. 1978 65 p refs
(Grant AF-AFOSR-3196-77)
(AD-A059018; AFOSR-78-1171TR) Avail: NTIS HC A04/MF A01 CSCL 17/5

This report describes investigations of the dense plasma focus designed to study turbulent processes. A CO2 laser collective scattering experiment with a high sensitivity was performed to measure the collective fluctuation spectrum. Scattering was observed from small, overdense regions and was correlated with micropinches seen in soft X-ray photographs. Bremsstrahlung was measured near the electron plasma frequency to determine a possible role for beam plasma instabilities. Only thermal bremsstrahlung levels were detected. Author (GRA)

N79-13346# Hughes Research Labs., Malibu, Calif.
EXPLORATORY DEVELOPMENT ON ANTIREFLECTIVE COATING FOR 2 TO 6 MICROMETERS FOR FLUORIDE WINDOWS Final Report, May 1976 - Dec. 1977
J. Earl Rudisill Mar. 1978 77 p
(Contract F33615-76-C-5139; AF Proj. 317J)
(AD-A059173; AFML-TR-78-19) Avail: NTIS HC A05/MF A01 CSCL 11/3

The exploratory development program described in this report had as its basic objective the provision of antireflection thin films or thin film systems for single crystal and polycrystalline alkaline earth fluoride laser window materials. The films must be of sufficiently high optical quality and uniformity to satisfy the constraints imposed by use as coating materials in high-power infrared DF and CO laser systems operating in the 2 to 6 micro m region. In addition, they must have sufficient ruggedness to survive the environmental conditions expected in such an operation. Since the performance of the deposited film systems, and therefore of the finished coated window, is critically dependent on substrate quality, an important part of this program was the development of adequate substrate polishing, cleaning, and handling procedures. Because windows approaching 1/2 m in diameter may be required in the future, both the substrate preparation and the thin film deposition techniques were established with a sufficiently high degree of reproducibility and quality control so that the technology could be and was successfully scaled up and transferred to an operating division after a short developmental period. GRA

N79-13347# Texas Technological Univ., Lubbock. Plasma Lab.
PLASMA-LASER INTERACTIONS WITH SOLID POLYSTYRENE MICROSPHERES Interim Technical Report
David L. Smith 3 Oct. 1977 111 p ref
(Grant AF-AFOSR-2639-74; AF Proj. 2301)
(AD-A059049; TR-715; AFOSR-78-1243TR) Avail: NTIS HC A06/MF A01 CSCL 20/9

The basic mechanisms involved in a solid-plasma interaction have been studied. In order to measure the ablation rates of solid polystyrene spheres of 50 to 150 micrometers radii, the pellets were suspended on glass fibers and exposed to a dense, hot theta pinch plasma. The pellet sizes were measured before and after each 2 microsec pellet-plasma interaction, and the results were plotted against several plasma parameters. Qualitative agreement with recent theoretical scaling laws was obtained. The pellet surfaces acquired a fine polish when exposed to a plasma as indicated by electron microscopy. Comparison of the ionization intensities in the ablating neutral material through the first four carbon lines indicated pellet cloud temperatures in the range of 5 eV. Both spectroscopy and streak camera photography showed that focusing a Q-switched ruby laser on the pellet during the plasma interaction produced a marked increase in the ionization intensities that was sustained long after the laser pulse. The pellet-plasma interaction alone was determined to be an inefficient means of generating X-rays. The combination pellet-plasma-laser interaction promises to be a feasible radiation source for durations much longer than those produced with only the laser-solid system. GRA

N79-13348# Rockwell International Science Center, Thousand Oaks, Calif.
THE III-V SEMICONDUCTOR 1.06 MICROMETERS ELECTRO-OPTIC STRUCTURES Interim Technical Report, 20 Oct. 1976 - 20 Oct. 1977
L. R. Tomasetta, H. David Law, and J. S. Harris Wright-Patterson AFB, Ohio AFAL Mar. 1978 84 p refs
(Contract F33615-77-C-1005; AF Proj. 2001)
(AD-A058905; SC5086.14TR; AFAL-TR-78-34) Avail: NTIS HC A05/MF A01 CSCL 17/5

The most significant results to date have been concentrated in the material and device development area. In the material area, three alloys systems have been explored, GaAsSb, GaAlSb, and InGaAsP. The high dislocation density of GaAsSb has been reduced by a series of lattice matching layers. An intensive study of dopants in this material has been made and doping control to the low 10 to the 15th power per cu cm has been achieved. A doping drop method has been developed to reduce interface defects and compositional variation in the grown layer. In the GaAlSb system the better lattice match between epilayer and substrate results in a very smooth surface morphology. Avalanche photodiodes fabricated from this system show extremely uniform photoresponse over the entire optically active area even at microwave avalanche gains as high as 20. A detailed study of the electron and hole ionization coefficients have been made and indicate a factor of two difference. This implies an excess multiplication noise factor of 0.75 which, although larger than the silicon (0.4), is significantly smaller than GaAs (1.0). The most promising material system is the InGaAsP quaternary. In this system, the epilayer lattice constant is 'forced' to match that of the substrate. The best surfaces of any III-V system have been achieved in the quaternary. LEDs fabricated from grown layers show excellent performance, and lifetime tests are currently being initiated. GRA

N79-13349# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ELECTROOPTICAL DEVICES Semiannual Technical Sum-

mary, 1 Oct. 1977 - 31 Mar. 1978
Ivars Melngailis and Arthur G. Foyt, Jr. 31 Mar. 1978 9 p refs
(Contract F19628-78-C-0002)
(AD-A059062; ESD-TR-78-206) Avail: NTIS HC A02/MF A01 CSCL 20/5

The current objectives of the electrooptical device program are: (1) to perform life tests on GaInAsP/InP double-heterostructure (DH) diode lasers operating in the 1.0- to 1.3 micro m wavelength region and analyze the degradation mechanisms, and (2) to fabricate and study avalanche photodiodes of similar composition GaInAsP operating in the same wavelength region. Room-temperature CW operation of DH GaInAsP/InP stripe-geometry lasers for periods of 1000 to 7000 hr now seems to be routine. At higher temperatures, one mode of degradation has been tentatively identified as being due to increasing thermal resistance of the diode heat-sink contact. GRA

N79-13350# State Univ. of New York at Stony Brook.
NEW INVESTIGATION OF NITROGEN LASER INDUCED FLUORESCENCE IN FORMALDEHYDE: SPECTRA AND SPECTRALLY RESOLVED LIFETIMES Ph.D. Thesis
Ralph Ernest Chatham Dec. 1977 240 p refs Sponsored by Naval Postgraduate School
(AD-A059083) Avail: NTIS HC A11/MF A01 CSCL 20/5

There is a considerable interest in the lifetimes and predissociation mechanisms of the excited formaldehyde molecule, H2CO. Active research is being conducted in the use of this predissociation via selective laser excitation to separate various isotopes of the three atomic species which make up the molecule. In addition, the molecule's comparatively simple structure and a large body of experimental data concerning that structure make it a useful test case for theoretical models. There are also astrophysical applications. The fact that light in the near ultraviolet causes dissociation of formaldehyde with a quantum yield which is close to one makes the molecule a sensitive detector of the radiation environment in the dense interstellar molecular clouds in which it has been observed by radio astronomy. Author (GRA)

N79-13351# Hughes Research Labs., Malibu, Calif.
ULTRA LOW LOSS COATINGS OF KCl LASER WINDOWS Final Report, 1 Jun. 1976 - 31 Dec. 1977
David Zuccaro Mar. 1978 72 p refs
(Contract F33615-76-C-5319; AF Proj. 317J)
(AD-A058524; AFML-TR-78-20) Avail: NTIS HC A04/MF A01 CSCL 11/5

In the last few years, several low optical absorption 10.6 micrometer AR coatings for KCl have been developed at Hughes Research Laboratories (HRL) and at other laboratories. The objective of this program was the development of 9.27 micrometer AR coatings which have a film absorption loss of less than 0.01% and a reflection of less than 0.1% per surface. The achievement of the program objective will permit the development of a 9.27 micrometer AR coating for a 32.5 cm diameter polycrystalline KCl window. Because previous studies had shown that castings deposited under ultra-high vacuum (UHV) conditions had lower absorption losses than did coatings deposited in conventional vacuum systems, the present study was limited to UHV-deposited films. Mass spectrometer analysis had shown that impurities were evolved occasionally during the evaporation of film materials. As a consequence, residual gas analysis (RGA) was performed to ensure that impurities were not present in the system. Also if impurities were located in the film materials, either they were removed by reactive atmosphere processing (RAP) or techniques were developed to prepare clean material. GRA

N79-13352# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
INFRARED ABSORPTION IN ZINC SELENIDE THIN FILMS Final Report, 1 Jul. 1974 - 30 Jun. 1977
David F. OBrien May 1978 92 p refs
(AD-A058382; AFML-TR-78-37) Avail: NTIS HC A05/MF A01 CSCL 20/5

Low loss antireflection coatings for infrared laser windows have been found to have absorption coefficients which are three to four orders of magnitude higher than was predicted from bulk material properties. An investigation of the causes for this increase in zinc selenide coatings was performed. Prior growth studies and theoretical descriptions of the thin film growth process indicated that variations in stoichiometry might be a cause for the high absorption measured in the coatings. An experimental program in which zinc selenide coatings were deposited onto calcium fluoride substrates under a wide variety of conditions revealed that the infrared absorption of the coatings decreased as the deposition rate was lowered. This correlated directly with the theoretical predictions based upon stoichiometry variations. Several surface and chemical techniques indicated that the most probable cause for the abnormal absorption in zinc selenide thin films was an increase in the zinc to selenium ratio which could be controlled to some extent by proper selection of vacuum deposition conditions. Author (GRA)

N79-13353# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
RESEARCH IN LASER PROCESSES Semiannual Report, 1 Aug. 1977 - 31 Jan. 1978
A. V. Phelps and A. C. Gallagher 28 Apr. 1978 20 p refs
(Contract N00014-76-C-0123; ARPA Order 2683)
(AD-A058450) Avail: NTIS HC A02/MF A01 CSCL 20/5

The optical properties of electrical discharges in high pressure Na-Xe mixtures which are being evaluated for laser applications have been modeled. These models lead to the proposal that suitability of electrical discharge excitation for a metal vapor based excimer laser depends critically on the dissociative recombination coefficient for electrons and the dominant positive ion. Such a model can account for the low excited atom densities found previously in our NaXe experiments. The theoretical predictions of low optical pumping efficiency at the center of the resonance lines have been verified for the D1 and D2 lines of Na vapor, i.e., the fluorescence efficiency decreases to about 7% at line center for a sodium density of 10 to the 15th power atom cu cm. Much improved measurements have been made of collisional relaxation rate coefficients for the v=0 and v=1 vibrational levels of the N 2 sub (A 3 Sigma(+) sub u) state. Author (GRA)

N79-13354# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
EFFICIENT MODEL FOR HF LASERS WITH ROTATIONAL NONEQUILIBRIUM Interim Report
Joseph J. T. Hough 15 Aug. 1978 18 p refs Sponsored in part by the Navy
(Contract F04701-77-C-0078)
(AD-A058389; TR-0078(3725)-2; SAMSO-TR-78-79) Avail: NTIS HC A02/MF A01 CSCL 20/5

A method for modeling rotational nonequilibrium in HF(DF) laser systems that significantly reduces the computation time required for such calculations is described. With this formulation, an approximation can be obtained of the nonequilibrium optical gains of the individual v, J transitions without computing the individual populations for each v, J state, which appreciably reduces the number of integration variables. The predictions of a pulsed H2-F2 laser model utilizing this approach are very similar to the predictions of a more complex model. The computational economy gained makes feasible parametric studies to improve understanding of the importance of rotational relaxation in laser calculations. Author (GRA)

N79-13355# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
THALLIUM IODIDE COATINGS FOR POTASSIUM CHLORIDE FOR 9.27 MICROMETERS Final Report, 1 Mar. 1976 - 1 Oct. 1977
Melvin C. Ohmer Feb. 1978 66 p refs
(AF Proj. 2423)
(AD-A058789; AFML-TR-77-157) Avail: NTIS HC A04/MF A01 CSCL 17/5

Five three-layer antireflection coatings for potassium chloride incorporating thallium iodide were investigated. The center layers considered were NaF, ThF4, and KCl. The coatings were tuned for 9.27 micrometers. The window absorption was typically 0.5%. This is a factor of five over the absorption of state of the art coatings at 10.6 micrometers. This increase in absorption is extremely significant. The power handling capability of a window

scales with absorption and these absorption measurements indicate that halid windows for operation at 9.27 micrometers must be significantly derated. Two approaches for systematically investigating possible antireflection coating designs for the case of three layers are presented. GRA

N79-13356# Naval Civil Engineering Lab., Port Hueneme, Calif.
LASER-BASED REMOTE MEASUREMENT OF LARGE BIAXIAL DEFLECTIONS Technical Note, Oct. 1976 - Mar. 1978
G. Warren Jul. 1978 35 p refs
(ZF61512001)
(AD-A058726; CEL-TN-1524) Avail: NTIS HC A03/MF A01 CSCL 13/13

A laser-based displacement measurement package is being developed as a tool for continuous, remote monitoring of the dynamic response of slender, very low frequency (VLF) antenna towers. The displacement monitor is designed for use where instrumentation cables are prohibitive due to intense electric fields. The system has been tested on antenna towers 380 meters in height to obtain biaxial displacement with a single sensor. Examples of results are presented with comparisons of results from velocity gages and accelerometers. Author (GRA)

N79-13357# Ohio State Univ., Columbus. Electroscience Lab.
A STUDY OF WATER VAPOR ABSORPTION AT CO2 LASER FREQUENCIES USING A DIFFERENTIAL SPECTROPHONE AND WHITE CELL Interim Technical Report, 1 Jan. - 30 Jun. 1978
John C. Peterson Jun. 1978 265 p refs
(Contract DAAG29-77-C-0010)
(AD-A058631; ESL-784701-2; ARO-14702.1-GS) Avail: NTIS HC A12/MF A01 CSCL 17/5

Water vapor absorption at CO2 laser frequencies has been studied using a differential spectrophone and a long path multiple traversal cell. The results of these measurements have been analyzed in terms of the Lorentz line shape and the far wing model for continuum absorption in the 9-10 micrometers wavelength region. An electronically stabilized, grating tunable cw CO2 laser with a nominal output power of 2 watts was used in performing measurements of water vapor absorption as a function of both pressure and temperature. Pressure broadened studies of H2O in N2 at a total pressure of 1 atm. were performed at 27 CO2 laser lines in the 9.4 and 10.4 micrometers bands. A technique for pure (low pressure) H2O measurements using the spectrophone is presented together with some preliminary results at the 10.6 micrometers P(20) laser line. White cell measurements of pure water vapor were performed at seven laser lines in the 9.4 and 10.4 micrometers bands; these data also indicate a significant negative temperature dependence for continuum absorption. GRA

N79-13358# Sandia Labs., Albuquerque, N. Mex.
ATOMIC IODINE LASER
G. A. Fisk, M. A. Gusinon, A. K. Hays, T. D. Padrick, R. E. Palmer, J. K. Rice, F. K. Truby, and M. E. Riley May 1978 91 p refs
(Contract EY-76-C-04-0789)
(SAND-78-1071) Avail: NTIS HC A05/MF A01

The atomic iodine photodissociation laser was under intensive study. The physics associated with this system is now well understood and it is possible to produce a 0.1 nsec (or longer) near diffraction limited laser pulse which can be amplified with negligible temporal distortion and little spatial deformation. The output of either a saturated or unsaturated amplifier consists of a high fidelity near diffraction limited, energetic laser pulse. A survey of the important areas affecting efficient laser operation is presented and findings are summarized. Detailed discussions and evaluations pertinent to pumps, chemical regeneration, and other elements in the overall laser system are included. Those areas that require further work and the nature of the work required to complete the full scale evaluation of the applicability of the iodine photodissociation laser to the internal confinement program are briefly discussed. DOE

N79-13359# California Univ., Livermore. Lawrence Livermore Lab.
GAS LASER CELLS: STRESS ANALYSIS OF CYLINDRICAL CELLS WITH RADIAL INJECTION OF ELECTRONS
William Lai Jul. 1978 11 p
(Contract W-7405-eng-48)
(UCID-17850) Avail: NTIS HC A02/MF A01

Selected for analysis is a simple, conservative model of a cylindrical cell pressurized to double the shock pressure. The hoop stress is given by the product of a coefficient, which accounts for the shock over pressure, and the classical hoop stress relation. The shock over pressure coefficient is linearly related to the volumetric energy deposition with slope inversely proportional to the product of initial gas density, specific heat, and temperature. The derived equation is applied to a design study of a selected range of laser parameters. The applicability of this simple analysis is discussed. Electron energy absorption curves for several metals are also presented. DOE

N79-13360# California Univ., Livermore. Lawrence Livermore Lab.
SHIVA LASER SYSTEM PERFORMANCE
J. A. Glaze, R. O. Godwin, and J. F. Holzrichter Jun. 1978 5 p refs
(Contract W-7405-eng-48)
(UCRL-52487) Avail: NTIS HC A02/MF A01

On November 18, 1977, after four years of experimentation, innovation, and construction, the Shiva HIGH Energy Laser facility produced 10.2 kJ of focusable laser energy delivered in a 0.95 ns pulse. The Shiva laser, with its computer control system and delta amplifiers, demonstrated its versatility on May 18, 1978, when the first 20-beam target shot with delta amplifiers focused 26 TW on a target and produced a yield of 7.5 x 10 to the 9th power neutrons. DOE

N79-13361# California Univ., Livermore. Lawrence Livermore Lab.
SHIVA: A 30 TERAWATT GLASS LASER FOR FUSION RESEARCH
James A. Glaze Feb. 1978 7 p Presented at ANS Ann. Meeting, San Diego, Calif., 18-23 Jun. 1978 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-80716; Conf-780622-23) Avail: NTIS HC A02/MF A01

The Shiva laser system employs a single actively modelocked Nd:YAG oscillator operating at 1.06 micron to drive 20 glass amplifier chains. A schematic of a single chain was shown with each chain containing, in order 2.5-cm and 5-cm rod amplifiers followed by 10-cm, 15-cm and 20-cm disk amplifiers. Small signal gains for these amplifiers are 40, 15, 3.8, 2.6 and 1.9 respectively. Pockels' cell and Faraday rotator stages were used to suppress parasitic oscillations and protect the chain from target reflections. Spatial filters placed at regular intervals along the chain dramatically increase the focusability of the beam by removing high frequency spatial modulation and by relaying the image of the flat-topped beam profile from one amplifier stage to the next. The image relay properties of the filters, by ameliorating diffractive effects, allow the aperture of the amplifiers to be effectively filled by the beam. The components of the Shiva laser are mounted on two separate support structures constructed of square steel tubing. DOE

N79-13362# Los Alamos Scientific Lab., N. Mex.
LASER-PLASMA INTERACTION IN A THETA-PINCH GEOMETRY
William Thomas Armstrong Jun. 1978 168 p refs
(Contract W-7405-eng-36)
(LA-7302-T) Avail: NTIS HC A08/MF A01

Prompt stimulated Brillouin scatter (SBS) is studied in an experiment wherein a high power, pulsed CO2 laser irradiates an independently produced, theta-pinch plasma. The SBS does not significantly affect laser heating of the plasma. Measurements of density profiles and temperature histories permitted examination of laser refraction, local heating, and net absorption. Refractive containment of the CO2 laser beam by an on-axis density minimum was observed at early times during the laser pulse. However, refractive containment was lost at late times due to the diffusive loss of the density minimum. Classical modeling of the expected heating required bleached absorption to account for the observed

heating. A plasma absorptivity of approximately 46% was inferred from calorimetry measurements at 250 mtorr fill pressure. These results confirm that classical heating and refraction dominated the laser-plasma interaction. DOE

N79-13363# National Technical Information Service, Springfield, Va.
METAL VAPOR LASERS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Oct. 1978
Mona F. Smith Oct. 1978 153 p Supersedes NTIS/PS-77/0915; NTIS/PS-76/-0695; NTIS/PS-75/725; NTIS/PS-75/015
(NTIS/PS-78/1121/9; NTIS/PS-77/0915; NTIS/PS-76/095; NTIS/PS-75/625; NTIS/PS-75/015) Avail: NTIS HC $28.00/MF $28.00 CSCL 20E

The bibliography of Federally-funded research cites studies on metal atom, metal dimer, and metal ion lasing, as well as metal vapor, generators for lasers. Studies on optical pumping, tuning devices, and excitation are included. Sodium, cesium, copper, and mercury vapor lasers are discussed, as well as their use in the visible and ultraviolet regions. This updated bibliography contains 146 abstracts, 31 which are new entries to the previous edition. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N79-13364* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TOTALLY CONFINED EXPLOSIVE WELDING Patent
Laurence J. Bement, inventor (to NASA) Issued 15 Aug. 1978 5 p Filed 10 Sep. 1973 Supersedes N73-32371 (11 - 23, p 2797) Division of US Patent Appl. SN-289048, filed 14 Sep. 1972, US-Patent-3,797,098
(NASA-Case-LAR-10941-2; US-Patent-4,106,687; US-Patent-Appl-SN-395493; US-Patent-Class-228-2.5; US-Patent-Class-29-421E; US-Patent-Class-228-107; US-Patent-3,797,098; US-Patent-Appl-SN-289048) Avail: US Patent and Trademark Office CSCL 13H

The undesirable by-products of explosive welding are confined and the association noise is reduced by the use of a simple enclosure into which the explosive is placed and in which the explosion occurs. An infrangible enclosure is removably attached to one of the members to be bonded at the point directly opposite the bond area. An explosive is completely confined within the enclosure at a point in close proximity to the member to be bonded and a detonating means is attached to the explosive. The balance of the enclosure, not occupied by explosive, is filled with a shaped material which directs the explosive pressure toward the bond area. A detonator adaptor controls the expansion of the enclosure by the explosive force so that the enclosure at no point experiences a discontinuity in expansion which causes rupture. The use of the technique is practical in the restricted area of a space station.

Official Gazette of the U.S. Patent and Trademark Office

N79-13365 Maryland Univ., College Park.
THE MEASUREMENT OF DAMPING AND THE DETECTION OF DAMAGE IN LINEAR AND NONLINEAR SYSTEMS BY THE RANDOM DECREMENT TECHNIQUE Ph.D. Thesis
Donald Wayne Caldwell 1978 141 p
Avail: Univ. Microfilms Order No. 7823990

Random decrement signatures formed from the random response of linear and nonlinear single degree of freedom vibratory systems were studied. The random responses of several linear analog computer models with different damping ratios were electronically bandpass filtered and Randomdec processed. The characteristic free vibration decay curve of each model was compared with the corresponding signature. In each case the Randomdec method produced signatures which closely resembled the actual system free decay curve. Several bandpass filter settings were used for each system to observe the effects in the resulting signatures and their damping characteristics. An equation which predicts the rms value of the numerical difference between a Randomdec signature and its corresponding free decay curve was derived. Dissert. Abstr.

N79-13366 Missouri Univ. -Rolla.
DEVELOPMENT OF A DESIGN PROCEDURE FOR FORGED BEVEL GEARS WITH A WEB Ph.D. Thesis
Ebraheem Mohammed Al-Shareedah 1978 139 p
Avail: Univ. Microfilms Order No. 7822370

When bevel gears are forged, a thin web results on the back of the teeth. This web, which results from the clearance between the dies, results in additional strength not accounted for, when the Lewis design criteria is used. To account for this excess strength a plate model is developed. The solution for this plate model can be obtained by assuming a polynomial deflection function, then by using the Galerkin variational method the constants in this assumed deflection function can be calculated. The plate model is compared with a finite element model, using a general purpose program and also with experimental strain measurements. This proposed plate solution indicates an increase in strength of more than 70 percent over the cantilever beam criteria of Lewis compared to the finite element results.

Dissert. Abstr.

N79-13367 Stanford Univ., Calif.
ON THE CONTROL OF FLEXIBLE MECHANICAL SYSTEMS Ph.D. Thesis
Gary Don Martin 1978 159 p
Avail: Univ. Microfilms Order No. 7822538

It is shown that the locations of actuators and sensors also determine the complexity of controller required to stabilize an undamped vibrational system. This is related to the zeros of the transfer functions from the inputs to the outputs. To accurately model the dynamics of flexible mechanical system, many vibration modes may need to be included in the system model. Optimal estimation and control for such a model can be too complex and too sensitive to modeling errors. A numerical algorithm is presented for optimizing controllers which have a fixed structure and are of lower dimension than the system model. A flexible inverted pendulum and an elastic spacecraft are discussed as examples of systems where mechanical flexibility is important in the control system design. The significance of actuator and sensor location is shown, and low order controllers are designed for these examples. Dissert. Abstr.

N79-13368 Notre Dame Univ., Ind.
MODELING OF THE CATALYTIC CONVERTER FOR AUTOMOTIVE EXHAUST GAS Ph.D. Thesis
Carmo Joseph Pereira 1978 221 p
Avail: Univ. Microfilms Order No. 7821652

The catalyst converter is considered from a chemical reactor theory viewpoint. Modeling is confined to the constituent elements of the packed bed and monolith converters. The problem involves diffusion and reaction of a reactant species in a single catalyst pellet or a tube-wall reactor. In the single catalyst pellet, the influence of a reaction rate following the bimolecular Langmuir-Hinshelwood mechanism is studied in lumped and distributed parameters systems. In the isothermal case, this rate is connected with negative order kinetics. For the isothermal and nonisothermal cases uniqueness and multiplicity are derived. The influence of uniform conditions is studied with a view to obtaining an optimum startup policy. The role of physico-chemical parameters is analyzed for a first order reaction in a catalyst pellet. Dissert. Abstr.

N79-13369*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF A NASVYTIS MULTIROLLER TRACTION DRIVE
Stuart H. Loewenthal, Neil E. Anderson (AVRADCOM Res. and Technol. Labs.), and Algirdas L. Nasvytis (Transmission Res., Inc.) Nov. 1978 36 p refs
(NASA-TP-1378; E-9632; AVRADCOM-TR-78-36) Avail: NTIS HC A03/MF A01 CSCL 13I

Tests were conducted to determine the operational and performance characteristics of a high-speed, 14.7-to-1 fixed-ratio Nasvytis Multiroller Traction Drive at speeds to 73,000 rpm and power levels to 127 kW (170 hp). The test drive was arranged in a single-stage, planetary configuration with two rows of stepped planet rollers contained between concentric sun

and ring rollers. It was lubricated with a traction fluid. Two drives were tested concurrently in a back-to-back arrangement. They exhibited good performance and operated smoothly, with a nominal peak efficiency of 95 percent. Variations of the design traction coefficient imposed by the automatic roller-loading device of 0.039, 0.048, and 0.057 seemed to have relatively little effect on any of the operating variables. Author

N79-13370*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE OTTO-ENGINE-EQUIVALENT VEHICLE CONCEPT
M. W. Dowdy and M. D. Couch 15 Dec. 1978 36 p refs Prepared for DOE
(Contract NAS7-100)
(NASA-CR-157840; JPL-Pub-78-101) Avail: NTIS HC A03/MF A01

A vehicle comparison methodology based on the Otto-Engine Equivalent (OEE) vehicle concept is described. As an illustration of this methodology, the concept is used to make projections of the fuel economy potential of passenger cars using various alternative power systems. Sensitivities of OEE vehicle results to assumptions made in the calculational procedure are discussed. Factors considered include engine torque boundary, rear axle ratio, performance criteria, engine transient response, and transmission shift logic. Author

N79-13371# Naval Academy, Annapolis, Md.
FUEL SYSTEMS FOR HEAT BALANCED INTERNAL COMBUSTION ENGINES Final Report, 1977-1978
Steven W. Petri 1 Jun. 1978 65 p refs
(AD-A058701; USNA-TSPR-94) Avail: NTIS HC A04/MF A01 CSCL 21/7

The Heat Balanced Engine (HBE) is a new class of internal combustion engines with unique fuel delivery requirements. In this study the characteristics and requirements of fuel metering and control techniques required for internal combustion engines in general are investigated. A general approach to the design and selection of fuel delivery systems for heat balanced engines has been developed. Using this approach, a particular fuel delivery system compatible with a specific two-stroke heat balanced engine has been selected, fabricated, and installed. An engine testing facility and simple model formulated for the engine have been established and a complete test program outlined. Author (GRA)

N79-13372# Honeywell, Inc., Hopkins, Minn. Defense Systems Div.
EPIC-2, A COMPUTER PROGRAM FOR ELASTIC - PLASTIC IMPACT COMPUTATIONS IN 2 DIMENSIONS PLUS SPIN Final Report, Feb. - Dec. 1977
Gordon R. Johnson Aberdeen Proving Ground, Md. ARBRL Jun. 1978 91 p refs
(Contract DAAD05-77-C-0730)
(AD-A058786; Rept-41154; AD-A05878; AD-E430097; ARBRL-CR-00373) Avail: NTIS HC A05/MF A01 CSCL 19/4

A two-dimensional (plus spin) computer program, EPIC-2, is described for impact and explosive detonation problems. The numerical technique is based on a Lagrangian finite element formulation in which the equations of motion are integrated directly rather than through the traditional stiffness matrix approach. Triangular elements are formulated for large strains and displacements, and nonlinear material strength and compressibility effects are included to account for elastic-plastic flow and wave propagation. Instructions for using the program are also included. Author (GRA)

N79-13373# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Advanced Structures Development Branch.
FASTENER RECESS EVALUATION Final Report, Jun. 1976 - Oct. 1977
Engebert Bannink, Gerald Bowman, and Forrest Sandow Apr. 1978 117 p refs
(AD-A059171; AFFDL-TR-78-22) Avail: NTIS HC A06/MF A01 CSCL 13/5

This report presents the results of a series of tests performed to establish the strengths and weaknesses of various recesses used in fasteners. Effects of torque, end load, paint, removal angle, hardness of bit, wear of bit, size of bit and damage to recess were studied. Data was taken both under ideal conditions in the laboratory and at various Air Force Bases around the country. Author (GRA)

N79-13374# Douglas Aircraft Co., Inc., Long Beach, Calif.
INTERACTIVE COMPOSITE JOINT DESIGN, PART 1 Final Technical Report, Apr. 1976 - Apr. 1978
M. K. Smith, L. J. Hart-Smith, and C. G. Dietz Apr. 1978 23 p
(Contract F33615-76-C-3058; AF Proj. 2401)
(AD-A058490; MDC-J7908-Pt-1; AFFDL-TR-78-38-Pt-1) Avail: NTIS HC A02/MF A01 CSCL 13/5

A computing technique was developed to determine the feasibility of combining the several batch computer programs for the analysis of composite joints into one interactive computer program utilizing graphics display. This approach proved successful and produced a design tool for the analysis of bolted or bonded composite joints. The program utilizes the software package provided by TEKTRONIX for the graphics display. The user works at the remote on-line graphics terminal in conjunction with the main computing facilities which contain the program. The final report discusses the summary, conclusion, and recommendations of the work performed. The User's Manual and Programming Manual discusses the input, output, and function of the program. Author (GRA)

N79-13375# Transportation Systems Center, Cambridge, Mass.
THE EMISSIONS AND FUEL ECONOMY OF A DETROIT DIESEL 6-71 ENGINE BURNING A 10-PERCENT WATER-IN-FUEL EMULSION Final Report, Mar. - Jun. 1976
Robert A. Walter Jul. 1978 81 p
(AD-A058550; TSC-USCG-78-1; USCG-D-10-78) Avail: NTIS HC A05/MF A01 CSCL 21/4

Initial efforts with water/fuel emulsions in diesel engines were directed toward the control of NOx. More recent studies emphasized the use of emulsions to improve fuel economy. It is believed that in a diesel engine combustion process, emulsified fuel droplets would undergo micro-explosions that would decrease the heterogeneity of the injector spray pattern and thus increase the efficiency and fuel economy. Although all data in the literature indicate that emulsions do lower the levels of NOx and smoke, carbon monoxide (CO) and hydrocarbons (HC) generally increase, depending on the amount of water in the emulsion, and the engine type, speed, and load. Reported fuel economy either decreases or increases, again, dependent on the water content, engine type and design, and engine speed and load. Other possible effects, such as increased fuel injector corrosion, water dilution of the lubricating oil, and the possibility of increased combustion chamber deposits have not been studied. The task reported here is a preliminary investigation of water/fuel emulsions in a GM6-71 engine. Surface active agents (surfactants), were used to produce the emulsions for this task. The purposes of this preliminary effort were to resolve the conflicting results in the literature, assess potential problem areas, and aid in formulating future efforts. GRA

N79-13376# Oklahoma State Univ., Stillwater. Coll. of Engineering.
IMPROVED ENGINE PERFORMANCE THROUGH HEAT TRANSFER CONTROL Final Report, 1 Jun. 1976 - 30 Jun. 1978
Richard G. Murray 28 Jul. 1978 112 p refs
(Grant DAAG29-76-G-0263)
(AD-A058637; ARO-14099.2-EX) Avail: NTIS HC A06/MF A01 CSCL 21/7

The advance of technology requires engines to be more efficient, weigh less, and be more reliable. Common materials used for engine parts are not designed close to their thermal limit for strength and lubrication. Additional component loading necessarily will demand a corresponding increase in component cooling. This increased cooling not only represents a thermodynamic loss that detracts from cycle efficiency but it also consumes additional engine power to operate the cooling system. A new approach to the thermal loading problem is to apply a thin layer of a ceramic insulator to combustion chamber surfaces thereby reducing heat transfer and metallic component temperature. The following document describes the results of a test program to evaluate engine performance for engines having

ceramic coatings. Both spark and compression ignition performance was examined. Author (GRA)

N79-13377# California Univ., Livermore. Lawrence Livermore Lab.
DEPARTMENT OF DEFENSE TRI-SERVICE PRECISION MACHINE-TOOL PROGRAM Quarterly Report, Feb. - Apr. 1978
1 Jun. 1978 14 p
(Contract W-7405-eng-48)
(UCRL-50053-78-1) Avail: NTIS HC A02/MF A01

Following a planning period during which the Lawrence Livermore Laboratory and the Department of Defense managing sponsor, the USAF Materials Laboratory, agreed on work statements, the Department of Defense Tri-Service Precision Machine-Tool Program began in February 1978. Milestones scheduled for the first quarter were met. Tasks and manpower requirements for two basic projects, precision-machining commercialization (PMC) and a machine-tool force (MTTF), were defined. DOE

N79-13378# McDonnell Aircraft Co., St. Louis, Mo.
GIROMILL WIND TUNNEL TEST AND ANALYSIS, VOLUME 2. TECHNICAL DISCUSSION Final Report, Jun. 1976 - Oct. 1977
W. A. Moran Oct. 1977 96 p refs
(Contract EY-76-C-02-2617)
(COO-2617-4/2) Avail: NTIS HC A05/MF A01

A wind tunnel test of a Giromill rotor was conducted. A three bladed Giromill rotor having a diameter of 2.13 m (7 ft) and a span of 1.52 m (5 ft) was tested. The blade modulations were accomplished through use of a cam and push rod arrangement. Replaceable cams provided the desired blade modulation at the various operating points. Various operating conditions were achieved by adjusting the rotor RPM and tunnel speed. The results show that the Giromill has good performance, equal to or much better than that predicted by theory, and outperforms the other types of vertical axis wind turbines tested. DOE

N79-13379# California Univ., Berkeley. Dept. of Mechanical Engineering.
OBSERVATION OF FLOW CHARACTERISTICS IN A MODEL I.C. ENGINE CYLINDER
Nobuhiko Ishikawa and John W. Daily Feb. 1978 31 p refs
Presented at the 1978 Soc. of Automotive Engrs. Congr. and Exposition, Detroit, 27 Feb. - 3 Mar. 1978
(Contract W-7405-eng-48)
(LBL-6894; Conf-780208-4) Avail: NTIS HC A03/MF A01

Fluid mechanical effects on unburned hydrocarbon generation were studied in a single compression expansion model automobile engine. Full optical access allowed the color Schlieren observations of various gas motion alongside the engine cylinder. Motion pictures of the gas motion and flame propagation were taken at a rate of seven thousand frames per second for the following cases: (1) intake stroke; (2) exhaust stroke; and (3) compression power stroke with combustion and blow-down with appropriate exhaust valve opening. Unburned fuel concentrations were measured by means of a gas chromatography. The results show that turbulent motion of the mixture increases the amount of unburned fuel. It is implied that the rolled-up vortices play an important role on wall flame quenching processes in an engine. DOE

N79-13380# Idaho National Engineering Lab., Idaho Falls.
JOINT GEOMETRY INFLUENCE ON MECHANIZED PIPE WELDING
J. F. Key and P. W. Turner Jun. 1978 36 p refs
(Contract EY-76-C-07-1570)
(TREE-1263) Avail: NTIS HC A03/MF A01

The development of a joint geometry for pulsed gas tungsten arc welding of austenitic stainless steel pipe in all positions is described. Preliminary work was performed with bead-on-pipe experiments and square-groove welds to determine approximate root face thicknesses. These values were used with U-groove weld designs to establish a basic joint configuration that is suitable for mechanized and manual pipe welding, either with or without consumable insert rings. DOE

N79-13381# National Technical Information Service, Springfield, Va.
HIGH TEMPERATURE BEARING. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Aug. 1978
William E. Reed Oct. 1978 164 p Supersedes NTIS/PS-77/0911; NTIS/PS-76/0784; NTIS/PS-75/716
(NTIS/PS-78/1060/9; NTIS/PS-77/0911; NTIS/PS-76/0784; NTIS/PS-75/716) Avail: NTIS HC $28.00/MF $28.00 CSCL 13I

The bibliography covers the design, development, applications, and material studies with applications to bearings, gas turbines, nuclear reactors, and space applications. Research on gas bearings, high speed bearings, and lubrication are included. This updated bibliography contains 158 abstracts, 12 of which are new entries to the previous edition. GRA

N79-13382# Amtech, Inc., Newton, Mass.
MICRO-ISOTOPE TOOL WEAR DETECTOR, PHASE 1 Final Report, 1 Oct. 1977 - 31 May 1978
L. C. Hoagland and W. D. Syniuta May 1978 92 p refs
(Grant NSF DAR-77-19517)
(PB-284699/6) Avail: NTIS HC A05/MF A01 CSCL 13I

The feasibility of a micro-isotope tool wear detection system for use with automated machining systems is evaluated. Lab tests had demonstrated that a micro-isotope particle could be implanted within the wear zone of a metal cutting tool in such a way as to assure integrity until it is removed as part of the worn tool material. The following tasks are described: (1)field evaluation; (2) universal implant fixture design; and (3)barriers to implementation. An accurate, reliable low cost field applications isotope implantation technique appears feasible. GRA

N79-13383# National Technical Information Service, Springfield, Va.
ROLLER BEARINGS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Sep. 1978
Guy E. Habercom, Jr. Oct. 1978 187 p Supersedes NTIS/PS-77/0986; NTIS/PS-76/0886; NTIS/PS-75/803
(NTIS/PS-78/1110/2; NTIS/PS-77/0986; NTIS/PS-76/0886; NTIS/PS-75/803) Avail: NTIS HC $28.00/MF $28.00 CSCL 13I

A bibliography containing 183 abstracts concerning design and performance of roller bearings is presented. Rolling contact bearing surfaces, hardening methods, mechanical properties, and lubricating techniques are among the areas reviewed. GRA

N79-13384# National Technical Information Service, Springfield, Va.
BALL BEARINGS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Sep. 1978
Guy E. Habercom, Jr. Oct. 1978 218 p Supersedes NTIS/PS-77/0995; NTIS/PS-76/0884; NTIS/PS-75/806
(NTIS/PS-78/1118/5; NTIS/PS-77/0995) Avail: NTIS HC $28.00/MF $28.00 CSCL 13I

A bibliography containing 214 abstracts concerning design and performance of ball bearings is presented. Wear resistance, lubrication means and effectiveness, and physical properties are among the parameters reviewed. GRA

N79-13385# National Technical Information Service, Springfield, Va.
BALL BEARINGS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Sep. 1978
Guy E. Habercom, Jr. Oct. 1978 210 p Supersedes NTIS/PS-77/0996; NTIS/PS-76/0885
(NTIS/PS-78/1119/3; NTIS/PS-77/0996; NTIS/PS-76/0885) Avail: NTIS HC $28.00/MF $28.00 CSCL 13I

A bibliography containing 206 abstracts concerning design and performance of ball bearings is presented. Wear resistance, lubrication means and effectiveness, and physical properties are among the parameters reviewed. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N79-13386# Naval Ship Research and Development Center, Bethesda, Md.
A COMPARISON OF ANALYTIC AND SIMULATION RELIABILITY AND MAINTAINABILITY (R/M) PREDICTION METHODS Final Report
Michael Gray Aug. 1978 107 p refs
(AD-A058707; DTNSRDC-78/070) Avail: NTIS HC A06/MF A01 CSCL 14/4

Two methods for predicting the reliability and maintainability (R/M) of systems are discussed--a simulation method and an analytic method. Two computer programs (SIM3 and GEMJR) incorporating these methods and their input and output are described. The simulation method uses Monte Carlo techniques in predicting reliability. The analytic method incorporates the Poisson failure process to develop stochastic matrices which can be solved using infinite series to give reliability and availability. The advantages and disadvantages of both methods are discussed. System configuration changes and complex missions can be considered more effectively using the simulation method. However, the simulation method does not calculate availability and provides only approximate results. In contrast, the analytic method predicts exact results and can examine such maintenance aspects as repairmen, standbys, and redundancies. Both methods are useful tools depending upon the R/M applications. Author (GRA)

N79-13387# George Washington Univ., Washington, D. C. Inst. for Management Science and Engineering.
SOME CONTRIBUTIONS TO THE METHODOLOGY FOR ANALYZING FAILURE DATA Ph.D. Thesis
Mahesh Chandra 7 May 1978 72 p refs
(Contracts N00014-77-C-0263; NRC-04-78-239)
(AD-A058499; Serial-T-373) Avail: NTIS HC A04/MF A01 CSCL 14/4

In this paper we deal with the important problem of failure data analysis. Our contributions can be classified into two broad categories. Under the first category comes the development of some goodness-of-fit tests for the Weibull distribution with unknown parameters. Our test statistics are functions of the empirical distribution function, and are based on an adaptation of some recent results on the theory of goodness-of-fit tests. Under the second category comes our proposal that the Lorenz curve methods of economic theory also be considered for use in the analysis of failure data. In the sequel, we point out several interesting connections between some well-known indicators in economic theory and a central concept in reliability theory. We feel that pointing out these connections between the two apparently different disciplines constitutes an important contribution of this paper. Author (GRA)

N79-13388# Battelle Pacific Northwest Labs., Richland, Wash.
PROGRAM TO DEVELOP ACOUSTIC EMISSION-FLAW RELATIONSHIP FOR INSERVICE MONITORING OF NUCLEAR PRESSURE VESSELS Progress Report, 1 Oct. 1977 - 1 Jan. 1978
P. H. Hutton, E. B. Schwenk, R. J. Kurtz, and C. Pavloff Mar. 1978 27 p ref
(Contract EY-76-C-1830)
(BNWL-2232-4; NUREG/CR-0124) Avail: NTIS HC A03/MF A01

An experimental evaluation of detecting and analyzing flaw growth in reactor pressure boundaries through continuous monitoring for acoustic emission (AE) was provided. Criteria for distinguishing significant flaws from innocuous sources and an AE-flaw damage model to serve as a basis for relating inservice AE to pressure vessel integrity were developed. A room temperature fracture test was performed on a one inch thick by six inch wide single edge notch (SEN) specimen. The results were similar to AE fracture test data obtained on 2T CT laboratory specimens in that the majority of AE occurred during crack propagation. DOE

N79-13389# Kaman Sciences Corp., Colorado Springs, Colo.
GO METHODOLOGY: SYSTEM RELIABILITY ASSESSMENT AND COMPUTER CODE MANUAL Final Report
W. Y. Gately and R. L. Williams May 1978 422 p refs Sponsored by Electric Power Research Inst.
(EPRI-NP-766) Avail: NTIS HC A18/MF A01

GO methodology is a computerized system reliability analysis technique. The methodology consists of two parts, system reliability evaluation and system fault sequence identification. The method employs a straightforward inductive logic for constructing system models; all possible system response modes, both successes and failures, are then determined. The purpose of the GO Manual is to explain GO procedure rationale and to provide detailed instructions for operating the computer programs. DOE

N79-13390# National Technical Information Service, Springfield, Va.
NONDESTRUCTIVE TESTING: X-RAY PHOTOGRAPHY AND RADIOGRAPHY. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Aug. 1978
William E. Reed Oct. 1978 254 p Supersedes NTIS/PS-77/0908; NTIS/PS-76/0780; NTIS/PS-75/666
(NTIS/PS-78/1058/3; NTIS/PS-77/0908; NTIS/PS-76/0780; NTIS/PS-75/666) Avail: NTIS HC $28.00/MF $28.00 CSCL 14B

Federally-sponsored research and foreign reports covering techniques, equipment, and applications are cited. Applications include flaw detection, fatigue determination, inspection of joints, and measurement of mechanical and physical properties. GRA

N79-13391# National Technical Information Service, Springfield, Va.
NONDESTRUCTIVE TESTING: X-RAY PHOTOGRAPHY AND RADIOGRAPHY, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Aug. 1976 - Aug. 1978
William E. Reed Oct. 1978 189 p Supersedes NTIS/PS-77/0910; NTIS/PS-76/0781
(NTIS/PS-78/1059/1; NTIS/PS-77/0910; NTIS/PS-76/0781) Avail: NTIS HC $28.00/MF $28.00 CSCL 14BB

The bibliography cites reports from worldwide research covering techniques, equipment, and applications. Applications include flaw detection, fatigue determination, inspection of mechanical and physical properties. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N79-13382 Michigan Univ., Ann Arbor.
COMPUTER EXTENSION OF THE RESPONSE OF NONLINEAR SYSTEMS TO STOCHASTIC EXCITATION Ph.D. Thesis
James Patrick Johnson 1978 266 p
Avail: Univ. Microfilms Order No. 7822927

Two physical systems were studied: a first-order system describing the motion of a free particle and the second-order simple harmonic oscillator. Each system has a small cubic nonlinearity and is undergoing white noise excitation. The system responses are modelled as Markov processes whose probability structures are determined from their associated Fokker-Planck-Kolmogorov equations. Caughy's eigen-function expansion technique is used to solve the Fokker-Planck-Kolmogorov equations and to obtain perturbation series solutions for the mean square responses. Computer extension is used to reveal the asymptotic series structure of the mean square responses. Finally, Dingle's theory of terminants is applied to accurately terminate the perturbation series representing the mean square response. Dissert. Abstr.

N79-13383 Washington Univ., Seattle.
EXPERIMENTAL STUDIES FOR THE COMBINATION OF

EXTERNAL AND INTERNAL PHOTOGRAMMETRY SYSTEMS Ph.D. Thesis
Rama Shankar Tiwari 1978 267 p
Avail: Univ. Microfilms Order No. 7824505

The combination of external and internal analytical photogrammetric systems, to generate correlated external and internal spatial measurements of an object, living body or material, were investigated in detail. Experiments on a number of models, using different calibration fields, were carried out to study the different possible approaches for combination. A common calibration frame was fabricated. Potential applications of the combined system in engineering and biomedical fields are discussed and experimental studies, in support of these were carried out. The biological problem of skin motion is introduced and the possibility of its evaluation, using the combined system, is demonstrated experimentally. Dissert. Abstr.

N79-13394 Washington Univ., Seattle.
THE ANALYSIS OF FRAMES WITH SEMI-RIGID CONNECTIONS Ph.D. Thesis
Thiva Thanesuen 1977 363 p
Avail: Univ. Microfilms Order No. 7823151

A theoretical study of the semi-rigid frames, which is the real behavior of steel structures, is presented. Theoretical analyses included formulation of the mathematical model of the relationship between the resisting moment and the relative rotation of the semi-rigid connection, their mathematical bi-linear models, their analytic solution for the member stiffness matrix, and their analytic solution for both elastic and plastic cases. The stability of the semi-rigid frames was also considered. The results from the mathematical bi-linear model compare well with the test results of Rathbun. Dissert. Abstr.

N79-13395 Washington Univ., Seattle.,
P-CONVERGENT FINITE ELEMENT APPROXIMATIONS IN LINEAR ELASTIC FRACTURE MECHANICS Ph.D. Thesis
Anil Kumar Mehta 1978 143 p
Avail: Univ. Microfilms Order No. 7823147

The characteristics of p-convergent approximations of the strain energy, strain energy release rate, stresses and displacements to problems posed by two-dimensional linear elastic fracture mechanics are presented. A simple and accurate empirical formula is developed which predicts the variation of the error in strain energy with the number of degrees of freedom in p-convergent approximations. This provides a new method for calculating the strain energy release rate (and therefore the stress intensity factor), which is more efficient, in terms of overall computational effort, than any method previously proposed, including those that employ special crack tip elements. Dissert. Abstr.

N79-13396 Michigan Univ., Ann Arbor.
HYSTERESIS BEHAVIOR OF BRACING MEMBERS AND SEISMIC RESPONSE OF BRACED FRAMES WITH DIFFERENT PROPORTIONS Ph.D. Thesis
Ashok Kumar Jain 1978 365 p
Avail: Univ. Microfilms Order No. 7822923

A new hysteresis model is proposed for steel tubular members which includes reduction in compressive strength and increase in member length with number of cycles, performed with the purpose to define situations in which end moments dominate over axial forces in bracing members or vice versa, and to develop an understanding of the inelastic behavior of braced frames. Fifteen 7-story concentrically and eccentrically braced frames were analyzed under monotonic elastic and inelastic loading conditions. Three split K braced frames were designed in accordance with 1976 UBC with different girder, brace and column proportions and subjected to severe earthquake motion. Dissert. Abstr.

N79-13397 Arizona Univ., Tucson.
DUCTILITY AND STRENGTH OF SINGLE PLATE CONNECTIONS Ph.D. Thesis
Paul Edward Gillett 1978 171 p
Avail: Univ. Microfilms Order No. 7824366

A study of the strength and durability of single plate framing connections was made by a combination of experimental work and finite element analysis. The experimental work consisted of a series of load-deformation measurements on two plates connected by a single bolt loaded in single shear. These load-deformation relationships were used as the properties of a shear fastener element representing one bolt in finite element models of single plate framing connections. Moment-rotation curves were obtained through use of the finite element models for a variety of loading patterns in order to establish patterns of behavior for the connections. A nondimensional moment-rotation equation was developed from the moment-rotation curves, along with an equation for limiting rotations to prevent bolt or plate failure, or excessive deformations. Dissert. Abstr.

N79-13398 Stanford Univ., Calif.
EULERIAN FINITE ELEMENT PLASTICITY ANALYSIS Ph.D. Thesis
Kevork Artin Derbalian 1978 113 p
Avail: Univ. Microfilms Order No. 7822492

An Eulerian finite element technique was formulated based on an updated Lagrangian scheme which maintains the mesh fixed in space by interpolating stresses at each increment of loading in the original underformed configuration and adding to these stresses the incremental stresses that result during the Lagrangian forward step. An example of steady flow of an elastic-plastic metal through a converging channel was analyzed using the proposed fixed mesh updated Lagrangian technique. An exact solution was also obtained by numerically integrating the governing field equations at steady state. Excellent agreement was shown between the exact and finite element solutions for this problem. Some examples of metal extrusion problems were analyzed using the Lagrangian formulation with elements which provide high order interpolating shape functions in preparation for the Eulerian analysis. Finally, a direct Eulerian variational principle was investigated and the resulting finite element equations were compared with the updated Lagrangian equations. Dissert. Abstr.

N79-13399 Utah Univ., Salt Lake City.
STUDIES IN VISCOELASTIC FRACTURE Ph.D. Thesis
Kadreya El-Hindawy Abou-Sayed 1978 154 p
Avail: Univ. Microfilms Order No. 7822810

The problem of quasi static growth of a finite length crack in a linearly viscoelastic material was considered. A fracture criterion was obtained from the application of the thermodynamic power balance to the Griffith problem of a line crack in an infinite sheet of a linearly viscoelastic material. The energy flux into the moving crack tip was evaluated for the viscoelastic analog of the Freund's problem, and was shown to depend on the instantaneous modulus of the material for the singular line crack model. The concept of a history dependent fracture energy was introduced. A quasi-elastic analysis was used to obtain a fracture growth that involves the time dependent viscoelastic moduli appropriate to the type of applied boundary loading, as time dependence is expected on the basis of experimental results. Dissert. Abstr.

N79-13400 Arkansas Univ., Fayetteville.
ANALYSIS AND EFFECT OF HYSTERESIS ON A RANDOMLY EXCITED NONLINEAR LUMPED PARAMETER SYSTEM AND ON A HARMONICALLY EXCITED UNIFORM BAR WITH NONLINEAR DISTRIBUTED YIELDING Ph.D. Thesis
Mohammad Hassan Mohsenian 1978 124 p
Avail: Univ. Microfilms Order No. 7823255

The first problem addressed is a lumped parameter problem which is subjected to a random excitation force, a linear viscous damper, and a binonlinear restoring element. The ratio of the resulting motion to that of the completely linear system was sought. The second problem is a continuum problem whose material is modeled to behave in a distributed binonlinear fashion. The specific problem set forth is that of a fixed-free bar subject to a uniformly distributed harmonic excitation. This excitation force is in the longitudinal direction of the bar and the steady state longitudinal strain amplitude response was sought. A modal type approximate solution was used. This lead to a system of nonlinear algebraic equations to be solved for the modal coefficients and phase angles. The strain amplitudes were found at the fixed end of the bar. Dissert. Abstr.

N79-13401 Georgia Inst. of Tech., Atlanta.
AN ANALYSIS OF THE DOUBLE TORSION TEST Ph.D. Thesis

Ampere A. Tseng 1978 174 p
Avail: Univ. Microfilms Order No. 7822692

An extensive finite element analysis was undertaken to verify the integrity of a many-sided fracture toughness test, the double torsion test. Fracture toughness values were obtained for glasses, ceramics, polymers, and a variety of metals and alloys. A generalized calibration equation is provided for this test. A three-dimensional elastic analysis was performed to investigate the dependence of the stress intensity factors upon specimen geometry and loading conditions as well as crack size and shape. The complicated stress distribution, side-groove effect and free surface effect were also included in the analysis. A special wedge element embedded in the elastic crack front singularity was developed for this analysis. The crack front plasticity was also investigated. Dissert. Abstr.

N79-13402 California Univ., Davis.
CREEP DAMAGE AND RUPTURE CRITERIA Ph.D. Thesis
Martin William Schwartz 1978 221 p
Avail: Univ. Microfilms Order No. 7822671

Creep damage in polycrystalline materials is characterized by a large variety of cavity nucleation and growth mechanisms highly sensitive to composition, microstructure, temperature and stress. To provide information relating directly to the extent of grain boundary decohesion, use is made of the change in apparent electrical resistivity that accompanies the formation of voids due to creep damage. Analysis of a highly idealized cavitated grain boundary indicated that the area of grain boundary decohesion is directly related to the ratio of the change in apparent density to the change in apparent resistivity. Experiments to verify this utilized long thin rods of alpha-brass which were subjected to creep tests aborted at various fractions of creep life.
Dissert. Abstr.

N79-13403*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BUCKLING TESTS OF STRUCTURAL ELEMENTS APPLICABLE TO LARGE ERECTABLE SPACE TRUSSES
W. L. Heard, Jr., H. G. Bush, and Nancy Agranoff Oct. 1978 61 p refs
(NASA-TM-78628) Avail: NTIS HC A04/MF A01 CSCL 20K

Detailed data on columns and center a joint for completeness is presented. Buckling data for a tripod arrangement of these columns using a cluster joint is also presented. The objectives of these test are: (1) to gain insight into joint requirements for truss structure; (2) to assess the structural qualities of the column and center joint designs; (3) to investigate the restraint provided by octetruss core members (tripod) to the cluster joints; (4) to provide insight into the level of analysis required to predict buckling behavior of Gr/E nestable columns both as simple columns and in a tripod arrangement; and (5) to provide a data base for Gr/E nestable columns. G.Y.

N79-13404*# National Aeronautics and Space Administration, Washington, D. C.
SOME QUESTIONS ON NONLINEAR DEFORMATION IN SOLIDS
N. M. Panfero, ed. and V. N. Kuznetsov, ed. Dec. 1978 140 p refs Transl. into ENGLISH from Moscow State Univ. Inst. of Mech. Sci. Trans. (Moscow), no. 8, 1971 p 1-107 Transl. by Al Ahram Center for Sci. Transl., Cairo, Egypt
(Contract NSF C-984)
(NASA-TT-F-17162) Avail: NTIS HC A07/MF A01 CSCL 13K

A collection dedicated to the theoretical and experimental studies of some nonlinear problems of deformed solid bodies is presented. Studies include: (1) the physical nonlinearity of the deformation of isotropic and anisotropic solids; (2) the geometrical nonlinearity in problems about stability with respect to final perturbations of elastic cylindrical shells; (3) the methods of solving nonlinear boundary value problems of thermo-viscoelasticity and thermal conductivity; and (4) the behavior of constructions in case of dynamical loading. Different analytical and experimental ways and methods are proposed for solving these problems; solutions of special problems are also given. G.Y.

N79-13405*# Battelle Columbus Labs., Ohio.
STRESS ANALYSIS FOR STRUCTURES WITH SURFACE CRACKS Final Report
J. C. Bell Aug. 1978 152 p refs
(Contract NAS3-21020)
(NASA-CR-159400) Avail: NTIS HC A08/MF A01 CSCL 20K

Two basic forms of analysis, one treating stresses around arbitrarily loaded circular cracks, the other treating stresses due to loads arbitrarily distributed on the surface of a half space, are united by a boundary-point least squares method to obtain analyses for stresses from surface cracks in places or bars. Calculations were for enough cases to show how effects from the crack vary with the depth-to-length ratio, the fractional penetration ratio, the obliquity of the load, and to some extent the fractional span ratio. The results include plots showing stress intensity factors, stress component distributions near the crack, and crack opening displacement patterns. Favorable comparisons are shown with two kinds of independent experiments, but the main method for confirming the results is by wide checking of overall satisfaction of boundary conditions, so that external confirmation is not essential. Principles involved in designing analyses which promote dependability of the results are proposed and illustrated. A.R.H.

N79-13406*# Battelle Columbus Labs., Ohio.
USER'S MANUAL FOR FRAC3D: SUPPLEMENT TO REPORT ON STRESS ANALYSIS FOR STRUCTURES WITH SURFACE CRACKS
J. C. Bell, A. T. Hopper, and P. A. Hayes Aug. 1978 125 p refs
(Contract NAS3-21020)
(NASA-CR-159401) Avail: NTIS HC A06/MF A01 CSCL 20K

The FRAC3D computer program, designed for use in analyzing stresses in structures (including plates, bars, or blocks) which may contain part-circular surface cracks or embedded circular cracks is described. Instructions are provided for preparing input, including that for the supporting programs LATTICE and MATSOL as well as for FRAC3D. The course of a substantial illustrative calculation is shown with both input and output. The formulas underlying the calculations are summarized and related to the subroutines in which they are used. Many issues of strategy in using this program for analysing stresses around surface cracks are elucidated. A.R.H.

N79-13407# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Applied Mathematics Group.
METHODS FOR DETERMINING MODAL PARAMETERS AND MASS, STIFFNESS AND DAMPING MATRICES Interim Report, Apr. 1977 - Mar. 1978
Charles L. Keller Jun. 1978 77 p refs
(AF Proj. 2304)
(AD-A058788; AFFDL-TR-78-59) Avail: NTIS HC A05/MF A01 CSCL 20/11

Methods for determining modal parameters and mass, damping and stiffness matrices from vibration tests are described mathematically. The emphasis is on methods which, at least in principle, are capable of determining the desired quantities from excitations at a single point. A method which determines the modal parameters and the mass, damping and stiffness matrices from the steady state response to sinusoidal excitations is proposed. A computer program of this method and the results of two numerical experiments are given. The first experiment is for the case of simple characteristic values. In the second experiment, one characteristic value is of multiplicity two. The other methods examined usually determine the desired quantities from the transient response. The mathematical background for all the methods is given. GRA

N79-13408# Weidlinger Associates, New York.
TRANSIENT RESPONSE OF STRUCTURES BY USE OF COMPONENT MODES
J. M. Klosner and D. Ranlet Feb. 1978 46 p refs
(Contract N00014-72-C-0119)
(AD-A059002; TR-22) Avail: NTIS HC A03/MF A01 CSCL 13/13

A general method is presented for obtaining the dynamic equations of an elastic structure to which elastic and/or nonlinear substructural elements are attached. Author (GRA)

N79-13408# Douglas Aircraft Co., Inc., Long Beach, Calif.
FORMAT: FORTRAN MATRIX ABSTRACTION TECHNIQUE. VOLUME 5, SUPPLEMENT 3: ENGINEERING USER AND TECHNICAL REPORT, EXTENDED
J. Pickard May 1978 18 p refs
(Contract F33615-75-C-3105)
(AD-A059172; MDC-J7174; AFFDL-TR-66-207-Vol-5-Sup-3)
Avail: NTIS HC A02/MF A01 CSCL 20/11

The FORMAT system has been augmented with new capabilities applicable to elastic stability and dynamic analyses and has been modified to improve operating efficiency and user convenience. A new large order eigen solution module and a module to evaluate matrices representing specific forms of complex exponents of the natural logarithmic base have been added. Efficiency improvements have been made to the matrix multiply, transposition and decomposition modules. In addition, the decomposition module has been modified to perform congruent transformations yielding the upper triangular form of the resulting matrix. The capability to create user defined leading diagonal or full rectangular matrices with constant element values has been added to the matrix card input module. The capability of modifying available work space parameters with user input has also been provided. Author (GRA)

N79-13410# California Univ., San Diego. Dept. of Applied Mechanics and Engineering Sciences.
ON LATERAL BUCKLING OF END-LOADED CANTILEVER BEAMS Interim Report
E. Reissner Jul. 1978 18 p refs
(Contract N00014-75-C-0156)
(AD-A058856) Avail: NTIS HC A02/MF A01 CSCL 13/13

The classical problem of lateral buckling of cantilever beams with transverse end-load is re-examined, as an example of a problem fully governed by the intrinsic equations of Kirchhoff's curved beam theory. It is shown that a suitable non-dimensionalization of the differential equations of the problem leads to a straightforward perturbation solution, with leading and second-order terms of the expansion having well-defined differences in physical significance. The equations of a recent extension of Kirchhoff's theory, which take account of transverse shear deformation, are used for the purpose of obtaining a numerical result for the influence of shear deformability on the lateral buckling load. Author (GRA)

N79-13411# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
SOME REFLECTIONS ON MATERIAL STABILITY
R. S. Rivlin Jul. 1978 29 p refs
(Contract N00014-76-C-0235)
(AD-A059199; CAM-100-30) Avail: NTIS HC A03/MF A01 CSCL 20/11

A plane sinusoidal wave of infinitesimal amplitude propagates in an isotropic elastic material which is subjected to a finite pure homogeneous deformation. It is desired to obtain necessary and sufficient conditions on the strain-energy function which ensure that the wave velocity be real for all directions of propagation of the wave. This paper reviews the position which has been reached up to the present in attempts to solve this problem, both in the cases when the material is incompressible and when it is compressible. Author (GRA)

N79-13412# Southwest Research Inst., San Antonio, Tex.
FRACTURE BEHAVIOR CHARACTERIZATION OF SHIP STEELS AND WELDMENTS Final Report
P. H. Francis, T. S. Cook, and A. Nagy 1978 97 p refs
(Contract N00024-75-C-4058)
(AD-A058939; SSC-276) Avail: NTIS HC A05/MF A01 CSCL 11/6

In order to enlarge upon current understanding of the behavior of ship steels and weldments, a series of mechanical tests were performed on seven grades of ship steel. These steels were ABS-B, CS, AH-32, EH-32, ASTM A517-D, A678-C, and A537-B and covered the range of ordinary as-rolled, to high strength quenched and tempered alloys. In addition, all materials but the EH-32 were utilized to produce welded plates. These weldments, either manual shielded metal arc or submerged arc procedure, were then machined into test specimens. The test program was designed to probe a large number of specimen and material parameters. The mechanical tests performed were the static tension test, the Charpy impact test, weld side bend test, dynamic tear test, and the drop weight-nil ductility temperature test. Two structural tests were designed to exercise the crack initiation and arrest capability of the steels. One of these tests was the standard explosion crack starter test while the other was a variation of the explosion tear test. The results indicated the general superiority of the fracture performance of the high strength, quenched and tempered alloys over the ordinary ship steels. The structural tests demonstrated the superiority of the manual metal arc welding procedure. This result was generally confirmed by the results of the dynamic tear tests. The data were compared to the proposed fracture criterion proposed by Rolfe, et. al., as presented in SSC-244. Only one material, EH-32, passed all tests prescribed by the proposed criterion. Author (GRA)

N79-13413# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
A NOTE ON THE HADAMARD CRITERION FOR AN INCOMPRESSIBLE ISOTROPIC ELASTIC MATERIAL
K. N. Sawyers and R. S. Rivlin Jul. 1978 6 p refs
(Contract N00014-76-C-0235)
(AD-A059200; CAM-100-31) Avail: NTIS HC A02/MF A01 CSCL 20/14

It is demonstrated that material inequalities, which are necessary and sufficient to give real speeds for waves that propagate in principal planes, are not sufficient to give real speeds for propagation in an arbitrary direction. Author (GRA)

N79-13414# Lockheed-Georgia Co., Marietta.
EXTENDED STUDY OF FLAW GROWTH AT FASTENER HOLES. VOLUME 2: DATA TABULATIONS Final Report, 10 Jun. 1975 - 10 Jun. 1977
T. M. Hsu and W. M. McGee Apr. 1978 155 p
(Contract F33615-75-C-3099; AF Proj. 486U)
(AD-A059080; LG78ER0064-Vol-2; AFFDL-TR-77-83-Vol-2)
Avail: NTIS HC A08/MF A01 CSCL 13/5

An analytical and experimental investigation was conducted to characterize the fracture and cyclic-growth behavior of cracks emanating from various types of fastener holes, such as open, close-tolerance, interference-fit, and cold worked fastener holes. An analytical approach was developed for estimating stress intensity factors for through cracks emanating from these types of fastener holes. Approximate stress intensity factors for quarter-elliptical cracks emanating from a corner or the same types of fastener holes were derived from corresponding through-crack solutions. Two alloy plates (2219-T851 aluminum and 6Al-4V(ELI) beta annealed titanium) with and without intentional initial flaws were tested under constant amplitude cyclic load and flight-by-flight fighter and bomber spectrum loads. Two initial flaw shapes corresponding to a quarter-circular corner crack and a through-the-thickness crack and three inital crack lengths (small, intermediate and large) were used in the test program. Three levels of cold working and interference and one level of fastener load transfer were included for each alloy. The amount of load transferred through the loaded fastener was maintained uniformly at the level which produced a bearing stress equal to the far-field stress. GRA

N79-13415# Army Materials and Mechanics Research Center, Watertown, Mass.
STRESS INTENSITY ESTIMATES FOR A PERIPHERALLY CRACKED SPHERICAL VOID AND A HEMISPHERICAL SURFACE PIT Final Report
Francis I. Baratta Mar. 1978 14 p refs
(DA Proj. 1L1-62105-AH-84)
(AD-A058573; AMMRC-TR-78-15) Avail: NTIS HC A02/MF A01 CSCL 11/2

Stress intensity factors are estimated for three-dimensional defects which occur in ceramic bodies. The two idealized cases considered are: (1) a spherical void with a circumferential crack at its equator stressed by uniaxial tension at infinity; and (2) a hemispherical pit at a free surface of a semi-infinite body also stressed by uniaxial tension with a circumferential crack at the semiequator of the pit. These stress intensity factors, which are given as a function of the crack length L to radius R of the spherical void or hemispherical pit, are considered as estimates because of the approximate nature of the analysis. Author (GRA)

N79-13416# California Univ., San Diego. Dept. of Applied Mechanics and Engineering Sciences.
SOME CONSIDERATIONS ON THE PROBLEM OF TORSION AND FLEXURE OF PRISMATICAL BEAMS Interim Report
Apr. 1978 30 p refs
(Contract N00014-75-C-0158)
(AD-A058564) Avail: NTIS HC A03/MF A01 CSCL 13/13

Based on previous work for the problem of end-loaded cantilever beams with loading conditions prescribed in terms of displacements rather than stresses, for the purpose of defining shear center location in terms of influence coefficients, the present report using the principles of minimum potential and complementary energy for the establishment of upper and lower bounds for influence coefficients is modified. In applying the complementary energy principle an earlier procedure by not departing from a St. Venant stress distribution and by using instead a stress approximation in which both shear and normal stress distributions are determined through use of the variational equation. In doing this the problem is solved more simply than before, for a more general class of cases. GRA

N79-13417# Army Armament Research and Development Command, Watervliet, N. Y. Benet Weapons Lab.
THE INFLUENCE OF TIP MASS OFFSET ON THE STABILITY OF BECK'S COLUMN
G. L. Anderson, J. D. Vasilakis, and J. J. Wu May 1978 20 p refs
(DA Proj. 1L1-61102-AH-45)
(AD-A058345; AD-E440013; ARLCB-TR-78010) Avail: NTIS HC A02/MF A01 CSCL 20/11

In this report, the stability of a slender cantilever carrying a tip mass at its free end and subjected there to a follower force is investigated. Author (GRA)

N79-13418# Army Military Center, Alexandria, Va.
CONCENTRATED FORCE PROBLEMS IN TRANSVERSE ISOTROPY Ph.D. Thesis. Final Report
Giuliano Maria Toneatto 16 Jun. 1978 101 p refs
(AD-A058420) Avail: NTIS HC A06/MF A01 CSCL 20/2

Basic singular solutions for the equations of elasticity in a three-dimensional transversely isotropic domain are generated and studied. A rational approach is then presented for the generation of the solution of various concentrated-load problems in the half-space. In particular, a previously unknown solution for a concentrated load in the half-space parallel to the free surface is derived and discussed. A completeness proof for a stress-function approach for problems in three dimensional transverse isotropy is also presented. Author (GRA)

N79-13419# Oak Ridge National Lab., Tenn.
REPAIR WELD INDUCED RESIDUAL STRESSES IN THICK-WALLED STEEL PRESSURE VESSELS
G. C. Smith and P. P. Holz Jun. 1978 145 p refs
(Contract W-7405-eng-26)
(ORNL/NUREG/TM-153) Avail: NTIS HC A07/MF A01

If a flaw requiring corrective action were to be found in an operating nuclear pressure vessel, there would be considerable safety and economic implications. Should such a flaw be found, one possible corrective action would be an in situ repair weld. A repair of this type would presumably involve grinding away material in a region encompassing the flaw and then filling the resulting cavity with weld metal. Thermal stress relieving under those conditions could lead to serious difficulties associated with thermal expansion and warpage and would, therefore, most likely be avoided. Such a departure from normal procedure raises questions relating to residual stresses and material toughness levels which would have to be assessed before a repair could be recommended or approved. The residual stress measurements reported are intended to provide baseline information to aid in an assessment should such a repair ever have to be seriously considered. DOE

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N79-13420 Wisconsin Univ. - Madison.
THE SIMULATION OF GROUNDWATER TEMPERATURE IN SHALLOW AQUIFERS Ph.D. Thesis
Charles Bryce Andrews 1978 306 p
Avail: Univ. Microfilms Order No. 7815392

The flow of heat in shallow aquifers was investigated in the field and using a mathematical model to test the feasibility of using groundwater temperatures to estimate groundwater flow rates and to develop a mathematical model to simulate heat transfer in shallow acquifer systems. Two systems were studied: seepage of water from a power plant cooling lake and pumpage and injection of water for use in a residential heat pump system. A model which couples the partial differential equations describing groundwater flow with those describing heat transport in the subsurface was developed to simulate temperatures in shallow groundwater systems. The finite element method was used to solve the partial differential equations. Results indicate that standard error of estimated flow rates in shallow aquifers can be greatly reduced under some conditions if the variations in groundwater temperature are known. Dissert. Abstr.

N79-13421 Stanford Univ., Calif.
DESIGN AND IMPLEMENTATION OF DISTORTION-FREE COMPRESSION TECHNIQUES FOR LANDSAT DATA AND TELEVISION IMAGES Ph.D. Thesis
Patrice Jean-Marie Capitant deVillebonne 1978 79 p
Avail: Univ. Microfilms Order No. 782284

An original model of the digital image processing system is built with emphasis on the possible processing applications. Distortion-free compression techniques and compression techniques with distortion are positioned within the model. While usually compression is measured by a compression ratio, and application oriented study would measure it in terms of distortion. With this in mind, a review of the different compression techniques is made. Methods presently used to test the quality of the reconstructed images are also reviewed. Based on this analysis and using an original model for digital images, a fast distortion free compression technique is designed and the parameters are optimized for Landsat data and television images. Dissert. Abstr.

N79-13422* National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES, ISSUE 19
Oct. 1978 89 p
(NASA-SP-7041(19)) Avail: NTIS HC E05 CSCL 05B

This bibliography lists 337 reports, articles, and other documents introduced into the NASA Scientific and Technical Information System between July 1 and September 30, 1978. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. G.G.

N79-13423 Purdue Univ., Lafayette, Ind.
A PARAMETRIC MULTICLASS BAYES ERROR ESTIMATOR

FOR THE MULTISPECTRAL SCANNER SPATIAL MODEL PERFORMANCE EVALUATION Ph.D. Thesis
Bijan Gholamreza Mobasseri 1978 296 p
Avail: Univ. Microfilms Order No. 7821477

The integration of the scanner spatial model and the parameter classification error estimates provides the necessary technique to evaluate the performance of a multispectral scanner. A set of test statistics are specified and the corresponding output quantities computed by the characteristic function. Two sets of classification accuracies, one at the input and one at the output is estimated. The scanner's instantaneous field of view is changed and the variation of the output classification performance monitored. The same procedure is followed with additive noise at the scanner output. On the basis of theoretical results, the interaction between the classification accuracy, signal-to-noise ratio, spatial resolution, data spatial correlation and scanner aperture is explained and some suggestions regarding the selection of optimum system parameters is presented. Dissert. Abstr.

N79-13424*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
A COMPREHENSIVE DATA PROCESSING PLAN FOR CROP CALENDAR MSS SIGNATURE DEVELOPMENT FROM SATELLITE IMAGERY: CROP IDENTIFICATION USING VEGETATION PHENOLOGY Final Report
C. A. Hlavka, Principal Investigator, S. M. Carlyle, R. M. Haralick, and R. Yokoyama Jul. 1978 118 p refs ERTS
(Contract NAS5-20943)
(E79-10001; NASA-CR-157896; Rept-286-5) Avail: NTIS HC A06/MF A01 CSCL 02C

The author has identified the following significant results. The phenological method of crop identification involves the creation of crop signatures which characterize multispectral observations as phenological growth states. The phenological signature models spectral reflectance explicitly as a function of crop maturity rather than as a function of date. A correspondence of time to growth state is established which minimizes the smallest difference between the given multispectral multitemporal vector and a category mean vector. The application of the method to the identification of winter wheat and corn shows (1) the method is capable of discriminating crop type with about the same degree of accuracy as more traditional classifiers; (2) the use of LANDSAT observations on two or more dates yields better results than the use of a single observation; and (3) some potential is demonstrated for labeling the degree of maturity of the crop, as well as the crop type.

N79-13425*# Ministry of Construction, Seoul (South Korea).
LAND USE SURVEY AND MAPPING AND WATER RESOURCES INVESTIGATION IN KOREA Final Report
Jae Hwa Choi, Won-Ik Kim, and Dae-Sung Son, Principal Investigators 31 Aug. 1978 34 p Sponsored by NASA ERTS
(E79-10003; NASA-CR-157898) Avail: NTIS HC A03/MF A01 CSCL 08B

The author has identified the following significant results. Land use imagery is applicable to land use classification for small scale land use mapping less than 1:250,000. Land use mapping by satellite is more efficient and more cost-effective than land use mapping from conventional medium altitude aerial photographs. Six categories of level 1 land use classification are recognizable from MSS imagery. A hydrogeomorphological study of the Han River basin indicates that band 7 is useful for recognizing the soil and the weathering part of bed rock. The morphological change of the main river is accurately recognized and the drainage system in the area observed is easily classified because of the more or less simple rock type. Although the direct hydrological characteristics are not obtained from the MSS imagery, the indirect information such as the permeability of the soil and the vegetation cover, is helpful in interpreting the hydrological aspects.

N79-13426*# General Electric Co., Philadelphia, Pa. Space Div.
LANDSAT-2 AND LANDSAT-3 FLIGHT EVALUATION REPORT, 23 APRIL TO 23 JULY 1978
1 Aug. 1978 207 p refs ERTS
(Contract NAS5-21808)
(E79-10004; NASA-CR-156831; DOC-78SDS4232) Avail: NTIS HC A10/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-13427*# General Electric Co., Philadelphia, Pa. Space Div.
LANDSAT-3 LAUNCH AND FLIGHT ACTIVATION EVALUATION REPORT, 5 TO 9 MARCH 1978: LAUNCH THROUGH ORBIT 50 AND ORBIT ADJUST OPERATION
17 Mar. 1978 281 p refs ERTS
(Contract NAS5-21808)
(E79-10005; NASA-CR-156823; DOC-78SDS4203) Avail: NTIS HC A13/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-13428*# Agricultural Research Service, Phoenix, Ariz.
HCMM HEAT CAPACITY MAPPING MISSION Quarterly Progress Report, 1 Aug. - 31 Oct. 1978
Ray D. Jackson, Principal Investigator 31 Oct. 1978 7 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS (NASA Order S-40255-B)
(E79-10007; NASA-CR-157899) Avail: NTIS HC A02/MF A01 CSCL 02C

The author has identified the following significant results. Thermal imagery shows a large temperature variation over the 640 acre experimental site. The variation is due to the slope and aspect of the terrain as well as the aircraft flight direction (east-west versus north-south). In spite of these individual temperature differences, mean temperature values from 40 to 640 acre blocks are essentially identical regardless of aircraft flight direction.

N79-13429*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROJECT RONDONIA [NOTAS PREVIAS DO PROJETO RONDONIA]
Nelson deJesusParada, Principal Investigator and Sergio Monthez-uma Santoianni Guerra Aug. 1978 12 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E79-10012; NASA-CR-157901; INPE-1329-PE/159) Avail: NTIS HC A02/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-13430*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
POPULATION AND GROWTH ESTIMATES OF URBAN AREAS IN THE STATE OF SAO PAULO UTILIZING LANDSAT IMAGES [ESTIMATIVAS POPULACIONAIS E DE CRESCIMENTO DE AREAS URBANAS NO ESTADO DE SAO PAULO, COM UTILIZACAO DE IMAGENS LANDSAT]
Nelson deJesusParada, Principal Investigator and Celina Foresti Jun. 1978 115 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E79-10015; NASA-CR-157904; INPE-1298-TPT/095) Avail: NTIS HC A06/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-13431*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DEFORESTATION PLANNING FOR CATTLE GRAZING IN AMAZON BASIN USING LANDSAT DATA
Nelson deJesusParada, Principal Investigator, Armando Pacheco dosSantos, and Evlyn Marcia Leao deMoraisNovo Apr. 1978 54 p refs Presented at 3d UN/FAO Training Course on Remote Sensing Application, Rome, Italy, 15 May - 2 Jun. 1978 Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E79-10018; NASA-CR-157907; INPE-1225-PE/126) Avail: NTIS HC A04/MF A01 CSCL 02F

The author has identified the following significant results.

This research did not show the total potential of the LANDSAT system, but tried to open up new research aspects for the utilization of LANDSAT data in natural resource control. Results obtained through this research showed that LANDSAT data can be used to develop monitoring programs in the tropical forest areas of Brazil.

N79-13432*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

EVALUATION OF REFORESTED AREAS USING LANDSAT IMAGERY [ESTABELECIMENTO DE METODOLOGIA PARA AVALIACAO DE POVOAMENTOS FLORESTAIS ARTIFICIAIS, UTILIZANDO-SE DADOS DO LANDSAT]

Nelson deJesusParada, Principal Investigator, Pedro Hernandez Filho, and Yosio Edemir Shimabukuro Jun. 1978 173 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS

(E79-10019; NASA-CR-157908; INPE-1271-TPT/089) Avail: NTIS HC A08/MF A01 CSCL 02F

The author has identified the following significant results. Visual and automatic interpretation of LANDSAT imagery was used to classify the general Pinus and Eucalyptus according to their age and species. A methodology was derived, based on training areas, to define the legend and spectral characteristics of the analyzed classes. Imager analysis of the training areas show that Pinus taeda is separable from the other Pinus species based on JM distance measurement. No difference of JM measurements was observed among Eucalyptus species. Two classes of Eucalyptus were separated according to their ages: those under and those over two years of age.Channels 6 and 7 were suitable for the discrimination of the reforested classes. Channel 5 was efficient to separated reforested areas from nonforested targets in the region. The automatic analysis shows the highest classification precision was obtained for Eucalyptus over two years of age (95.12 percent).

N79-13433*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

UTILIZATION OF LANDSAT IMAGES FOR GEOLOGICAL INVESTIGATION IN THE CENTRAL PORTION OF MINAS GERAIS [APLICACAO DE IMAGENS LANDSAT NA COMPARTIMENTACAO TECTONICA EM MINAS GERAIS]

Nelson deJesusParada, Principal Investigator, Roberto Pereira deCunha, and Juercio Tavares deMattos Aug. 1978 16 p refs In PORTUGUESE; ENGLISH summary Presented at 30th Congresso Brasileiro de Geologia, Brazil, 1-7 Nov. 1978 Sponsored by NASA ERTS

(E79-10020; NASA-CR-157909; INPE-1325-PE/155) Avail: NTIS HC A02/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-13434*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

OVERVIEW OF BRAZILIAN REMOTE SENSING ACTIVITIES

Nelson deJesusParada, Principal Investigator and Claudio Roland Sonnenburg Aug. 1978 24 p refs Sponsored by NASA ERTS

(E79-10023; NASA-CR-157912; INPE-1323-NTE/126) Avail: NTIS HC A02/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-13435*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

EVALUATION OF SPECTRAL CHANNELS AND WAVELENGTH REGIONS FOR SEPARABILITY OF AGRICULTURAL COVER TYPES

Nelson deJesusParada, Principal Investigator and R. Kumar Sep. 1977 12 p refs Presented at Intern. Symp. on Remote Sensing of Environment, Ann Arbor, Mich., Apr. 1977 Sponsored by NASA ERTS

(E79-10024; NASA-CR-157913; INPE-1119-PE/087) Avail: NTIS HC A02/MF A01 CSCL 02C

The author has identified the following significant results. Multispectral scanner data in twelve spectral channels in the wavelength range of 0.4 to 11.7 microns acquired in the middle of July for three flightlines were analyzed by applying automatic pattern recognition techniques. The same analysis was performed for the data acquired in mid August, over the same three flightlines, to investigate the effect of time on the results. The effect of deletion of each spectral channel, as well as each wavelength region on P sub c, is given. Values of P sub c for all possible combinations of wavelength regions in the subsets of one to twelve spectral channels are also given. The overall values of P sub c were found to be greater for the data of mid August than the data from mid July.

N79-13436*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

COMPARISON OF FEATURE SELECTION TECHNIQUES FOR EARTH RESOURCES DATA

Nelson deJesusParada, Principal Investigator and Ravindra Kumar Sep. 1978 13 p refs Presented at Intern. Conf. on Machine-Aided Image Analysis, Oxford, England, 4-6 Sep. 1978 Sponsored by NASA ERTS

(E79-10025; NASA-CR-157914; INPE-1359-PE/167) Avail: NTIS HC A02/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-13437*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

APPLICATION OF LANDSAT SATELLITE IMAGERY AND OCEANOGRAPHIC DATA FOR VERIFICATION OF AN UPWELLING MATHEMATICAL MODEL [APLICACAO DAS IMAGENS DO SATELITE LANDSAT E DADOS OCEANOGRAFICOS NA VERIFICACAO DE UM MODELO MATEMATICO DE RESSURGENCIA]

Nelson deJesusParada, Principal Investigator, Keiko Tanaka, and Emmanuel Gama Almeida Aug. 1978 2,1 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains imagery. Original photography maybe purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(E79-10026; NASA-C -157915; INPE-1349-NTE/131) Avail: NTIS HC A02/MF A01 CSCL 08C

The author has identified the following significant results. Data obtained during the cruise of the Cabo Frio and from LANDSAT imagery are used to discuss the characteristics of a linear model which simulates wind induced currents calculated from meteorological conditions at the time of the mission. There is a significant correspondance between the model of simulated horizontal water circulation, sea surface temperature, and surface currents observed on LANDSAT imagery. Close approximations were also observed between the simulation of vertical water movement (upwelling) and the oceanographic measurements taken along a series of points of the prevailing currents.

N79-13438*# SRI International Corp., Menlo Park, Calif.

A SCENE-ANALYSIS APPROACH TO REMOTE SENSING Final Report

Jay M. Tenenbaum, Principal Investigator, Martin A. Fischler, and Helen C. Wolf Jun. 1978 85 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(Contract NASw-2865; SR Proj. 4683)

(E79-10029; NASA-CR-157916) Avail: NTIS HC A05/MF A01 CSCL 05B

The author has identified the following significant results. Geometric correspondance between a sensed image and a symbolic map is established in an initial stage of processing by adjusting parameters of a sensed model so that the image features predicted from the map optimally match corresponding features extracted from the sensed image. Information in the map is then used to constrain where to look in an image, what to look for, and how to interpret what is seen. For simple monitoring tasks involving multispectral classification, these constraints significantly reduce computation, simplify interpretation, and improve the utility of the resulting information. Previously intractable tasks requiring spatial and textural analysis may become straightforward in the context established by the map knowledge. The use of map-guided image analysis in monitoring the volume of water in a reservoir, the number of boxcars in a railyard, and the number of ships in a harbor is demonstrated.

N79-13439*# General Electric Co., Philadelphia, Pa. Space Div.
LANDSAT-1, LANDSAT-2, AND LANDSAT-3 FLIGHT EVALUATION REPORT, 23 JANUARY TO 23 APRIL 1978
3 May 1978 318 p refs ERTS
(Contract NAS5-21808)
(E79-10032; NASA-CR-156837; DOC-78SDS4216) Avail: NTIS HC A14/MF A01 CSCL 05B
There are no author-identified significant results in this report.

N79-13440*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
GENERATION OF UNIFORM CHROMATICITY SCALE IMAGERY FROM LANDSAT DATA
R. D. Juday, Principal Investigator, F. Johnson, R. A. Abotteen, and M. D. Pore Aug. 1978 42 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-15200)
(E79-10033; NASA-CR-151837; LEC-11867; JSC-14471) Avail: NTIS HC A03/MF A01 CSCL 20F
There are no author-identified significant results in this report.

N79-13441*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
NATIONWIDE FORESTRY APPLICATIONS PROGRAM: TEN-ECOSYSTEM STUDY (TES) SITE 3, ST. LOUIS COUNTY, MINNESOTA Final Report
J. E. Weaver, Principal Investigator Aug. 1978 53 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-15200)
(E79-10034; NASA-CR-151383; LEC-12262) Avail: NTIS HC A04/MF A01 CSCL 08F
There are no author-identified significant results in this report.

N79-13442*# International Business Machines Corp., Gaithersburg, Md.
SAR/LANDSAT IMAGE REGISTRATION STUDY Final Report, Apr. 1977 - Sep. 1978
Stephen W. Murphrey, Principal Investigator Sep. 1978 164 p refs ERTS
(Contract NAS6-2827)
(E79-10035; NASA-CR-156847) Avail: NTIS HC A08/MF A01 CSCL 05B
The author has identified the following significant results. Temporal registration of synthetic aperture radar data with LANDSAT-MSS data is both feasible (from a technical standpoint) and useful (from an information-content viewpoint). The greatest difficulty in registering aircraft SAR data to corrected LANDSAT-MSS data is control-point location. The differences in SAR and MSS data impact the selection of features that will serve as a good control points. The SAR and MSS data are unsuitable for automatic computer correlation of digital control-point data. The gray-level data can not be compared by the computer because of the different response characteristics of the MSS and SAR images.

N79-13443*# Servicio Geologico de Bolivia, La Paz.
[BOLIVIAN PROGRAM OF SATELLITE TECHNOLOGY OF EARTH RESOURCES, ERTS] [PROGRAMA DEL SATELITE TECHNOLOGICO DE RECURSOS NATURALES ERTS, BOLIVIA]
Carlos E. Brockmann, Principal Investigator Aug. 1978 127 p refs In SPANISH and ENGLISH Sponsored by NASA Original contains color illustrations ERTS
(E79-10036; NASA-CR-157919; Rept-2) Avail: NTIS HC A07/MF A01 CSCL 05B
There are no author-identified significant results in this report.

N79-13444*# Environmental Research Inst. of Michigan, Ann Arbor.
ANALYSIS OF SCANNER DATA FOR CROP INVENTORIES Progress Report, 15 Jun. - 11 Sep. 1978
John E. Colwell, Principal Investigator, Richard J. Kauth, Richard C. Cicone, and William A. Malila Sep. 1978 143 p refs EREP
(Contract NAS9-15476)
(E79-10037; NASA-CR-151840; ERIM-132400-12-P) Avail: NTIS HC A07/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13445*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
ANALYSIS OF THE EFFECTS OF INTERPOLATION AND ENHANCEMENT OF LANDSAT-1 DATA ON CLASSIFICATION AND AREA ESTIMATION ACCURACY
N. Chu, Principal Investigator, C. McGillem, and P. Anuta 4 Nov. 1977 22 p refs EREP
(Contract NAS9-14970)
(E79-10038; NASA-CR-151839; LARS-TR-110477) Avail: NTIS HC A02/MF A01 CSCL 05B
There are no author-identified significant results in this report.

N79-13446*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE APPLICATION OF REMOTE SENSORS IN THE INTERPRETATION OF LANDSAT DATA FOR REGIONAL GEOLOGICAL MAPPING IN THE CENTRAL PORTION OF MINAS GERAIS [APLICACAO DE SENSORES REMOTOS, COM ENFASE EN IMAGENS LANDSAT, EN MAPEAMENTO GEOLOGICO REGIONAL NO NORTE DE MINAS GERAIS]
Nelson deJesusParada, Principal Investigator, Juercio Tavares deMattos, and Roberto Pereira daCunha Apr. 1978 229 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E79-10039; NASA-CR-157926) Avail: NTIS HC A11/MF A01 CSCL 05B
There are no author-identified significant results in this report.

N79-13447*# Pennsylvania State Univ., University Park. Dept. of Meteorology.
APPLICATIONS OF HCMM SATELLITE DATA TO THE STUDY OF URBAN HEATING PATTERNS Quarterly Report, Sep. - Nov. 1978
Toby N. Carlson, Principal Investigator 1 Dec. 1978 3 p Sponsored by NASA ERTS
(E79-10040; NASA-CR-157927) Avail: NTIS HC A02/MF A01 CSCL 08B
There are no author-identified significant results in this report.

N79-13448*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE PHASE 3 ANALYST FIELD TRIP PLAN
[1978] 19 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10041; NASA-TM-79908; LACIE-00623; JSC-11680) Avail: NTIS HC A02/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13449*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE TRANSITION YEAR OPERATIONS PLAN
Dec. 1977 41 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10042; NASA-TM-79909; LACIE-00627; JSC-11704) Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13450*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE PHASE 3 INTERIM ACCURACY ASSESSMENT PLAN

Mar. 1978 134 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10043; NASA-TM-79910; LACIE-00628; JSC-13733)
Avail: NTIS HC A07/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13451*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE PHASE 3 ACCURACY ASSESSMENT PLAN
Sep. 1978 137 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10044; NASA-TM-79911; LACIE-00630; JSC-13743)
Avail: NTIS HC A07/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13452*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE INTEGRATED DROUGHT PLAN
May 1976 29 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10045; NASA-TM-79912; LACIE-00613; JSC-10828)
Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13453*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). PHASE 1 ACCURACY ASSESSMENT PLAN
Jan. 1976 59 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10046; NASA-TM-79913; LACIE-00610; JSC-10812)
Avail: NTIS HC A04/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13454*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LEVEL 3 BASELINE; LACIE INFORMATION EVALUATION (IE) IMPLEMENTATION/OPERATIONS PLAN
Sep. 1976 52 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10047; NASA-TM-79914; LACIE-C00618; JSC-11339)
Avail: NTIS HC A04/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13455*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE PHASE 2 ACCURACY ASSESSMENT PLAN
Nov. 1976 116 p refs Sponsored by NASA, NOAA, and USDA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10048; NASA-TM-79915; LACIE-00621; JSC-11665)
Avail: NTIS HC A06/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13456*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). TEST AND EVALUATION PLAN FOR KSU AND CCEA PHASE 3 YIELD MODELS
T. L. Barnett, Principal Investigator Apr. 1977 16 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10049; NASA-TM-79916; LACIE-00622; JSC-11677)
Avail: NTIS HC A02/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13457*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). IMPLEMENTATION PLAN FOR OPERATIONS COORDINATION CENTER
Apr. 1975 17 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10050; NASA-TM-79917; LACIE-00600) Avail: NTIS HC A02/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13458*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE CAMS TRAINING PLAN
Apr. 1975 48 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10051; NASA-TM-79918; LACIE-00601) Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13459*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE QUICK LOOK ACCURACY ASSESSMENT REPORT, REVIEW OF THE DECEMBER 17, 1976 CAR
30 Dec. 1976 13 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10052; NASA-TM-79919; LACIE-CD00438; JSC-11667)
Avail: NTIS HC A02/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13460*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LEVEL 3 BASELINE; LACIE OPERATIONS PLAN
11 Jul. 1975 75 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10053; NASA-TM-79920; LACIE-C00602) Avail: NTIS HC A04/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13461*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LEVEL 3 BASELINE; LACIE PROJECT DOCUMENTATION PLAN
Aug. 1975 59 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10054; NASA-TM-79921; LACIE-C00603; JSC-09851)
Avail: NTIS HC A04/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-13462*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). DETECTION OF EPISODIC PHENOMENA ON LANDSAT IMAGERY
C. M. Chesnutwood, Principal Investigator May 1976 29 p Sponsored by NASA, NOAA, and USDA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10055; NASA-TM-79922; LACIE-CD00501; JSC-11328)
Avail: NTIS HC A03/MF A01 CSCL 02C
The author has identified the following significant results. Episodic phenomena such as rainfall shortly before data pass, thin translucent clouds, cloud shadows, and aircraft condensation trails and their shadows are responsible for changes in the spectral reflectivities of some surfaces. These changes are readily detected on LANDSAT full-frame imagery. Histograms of selected areas in Kansas show a distinct decrease in mean radiance values, but also, an increase in scene contrast, in areas where recent rains had occurred. Histograms from a few individual fields indicate

that the mean radiance values for winter wheat followed a different trend after a rainfall than alfalfa or grasses.

N79-13463*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). SECOND-GENERATION SAMPLING STRATEGY EVALUATION REPORT
J. P. Basu, Principal Investigator, S. M. Dragich, and D. P. McGuigan Jul. 1978 200 p refs Sponsored by NOAA and USDA EREP
(Contract NAS9-15200)
(E79-10056; NASA-TM-79923; LACIE-00465; JSC-13729; LEC-11492) Avail: NTIS HC A09/MF A01 CSCL 02C

The author has identified the following significant results. The stratification procedure in the new sampling strategy for LACIE included: (1) correlation test results indicating that an agrophysical stratum may be homogeneous with respect to agricultural density, but not with respect to wheat density; and (2) agrophysical unit homogeneity test results indicating that with respect to agricultural density many agrophysical units are not homogeneous, but removal of one or more refined strata from any such current agrophysical unit can make the strata homogeneous. The apportioning procedure results indicated that the current procedure is not performing well and that the apportioned estimates of refined strata wheat area are often unreliable.

N79-13464*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). EFFECTS OF NON-RESPONSE INCLUDING CLOUD COVER ON AGGREGATION OF WHEAT AREA IN THE US GREAT PLAINS
A. Glen Houston, Principal Investigator Dec. 1976 40 p Sponsored by NASA, NOAA, and USDA EREP
(E79-10057; NASA-TM-79924; LACIE-00441; JSC-11672) Avail: NTIS HC A03/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-13465*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LACIE CROP CALENDAR TEST AND EVALUATION PLAN
Nov. 1975 21 p refs Sponsored by NASA, NOAA and USDA EREP
(E79-10058; NASA-TM-79925; LACIE-00608; JSC-09871) Avail: NTIS HC A02/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-13466*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). LANDSAT 3X GAIN STUDY
Oct. 1975 40 p refs Sponsored by NOAA and USDA EREP (Contract NAS9-12200)
(E79-10059; NASA-TM-79926; LACIE-00500; JSC-09868) Avail: NTIS HC A03/MF A01 CSCL 02C

The author has identified the following results. The maximum likelihood classifier on the ERIPS failed to show any improvement in accuracy when comparing high-gain LANDSAT data with the simulated normal-gain data. Even if an improvement in accuracy had been detected, the timespan within the crop growing season when the use of high-gain data could be advantageous is limited. A total of six sets of LANDSAT-1 imagery is available for the analysis of gain effects. Three of the sets are high-gain data in MSS bands 4 and 5, whereas the other three are simulated normal-gain. The four sets obtained over Imperial Valley have good supporting ground truth information for training; the two sets over Kansas do not. The use of various combinations of the six data sets is recommended in order to uncover the possible advantages of using the data.

N79-13467*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROJECT SUDAM: USE OF LANDSAT DATA TO STUDY THE IMPACT OF AGRICULTURAL PROJECTS IN THE AMAZON [PROJETO SUDAM: USO DE DADOS DO LANDSAT NO ESTUDO DO IMPACTO DA IMPLANTACAO DE PROJETOS AGROPECUARIOS DA AMAZONIA]
Nelson deJesusParada, Principal Investigator, Antonio Tebaldi Tardin, Armando Pacheco dosSantos, and Evlyn Marcia Leao deMoraisNovo Oct. 1977 23 p In PORTUGUESE Sponsored by NASA ERTS
(E79-10060; NASA-CR-157928; INPE-1136-NTE/106) Avail: NTIS HC A02/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-13468*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INPE REMOTE SENSING PROGRAM [PROGRAMA DE SENSORIAMENTO REMOTO DO INPE]
Nelson deJesusParada, Principal Investigator and Claudio Roland Sonnenburg Aug. 1978 10 p In PORTUGUESE Sponsored by NASA ERTS
(E79-10061; NASA-CR-157929; INPE-1345-AMD/001) Avail: NTIS HC A02/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-13469*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE TRANSITION PROTECT, FY 1978-1979: RE-ANALYSIS OF CCEA 1 US GREAT PLAINS WHEAT YIELD MODELS
Clarence M. Sakamoto, Principal Investigator (NOAA) Jun. 1978 107 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10062; NASA-TM-79927; LACIE-00472; JSC-13740; CCEA-TR-78-3) Avail: NTIS HC A06/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-13470*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). DETECTING AND MONITORING AGRICULTURAL VEGETATIVE WATER STRESS OVER LARGE AREAS USING LANDSAT DIGITAL DATA
David R. Thompson and Oscar A. Wehmanen, Principal Investigators Apr. 1978 26 p refs Sponsored by NASA, NOAA, and USDA EREP
(E79-10063; NASA-TM-79928; LACIE-00506; JSC-13737) Avail: NTIS HC A03/MF A01 CSCL 02C

The author has identified the following significant results. The Green Number Index technique which uses LANDSAT digital data from 5x6 nautical mile sampling frames was expanded to evaluate its usefulness in detecting and monitoring vegetative water stress over the Great Plains. At known growth stages for wheat, segments were classified as drought or non drought. Good agreement was found between the 18 day remotely sensed data and a weekly ground-based crop moisture index. Operational monitoring of the 1977 U.S.S.R. and Australian wheat crops indicated drought conditions. Drought isoline maps produced by the Green Number Index technique were in good agreement with conventional sources.

N79-13471*# National Oceanic and Atmospheric Administration, Washington, D. C.
APPLICATIONS OF HCMM DATA TO SOIL MOISTURE SNOW AND ESTUARINE CURRENT STUDIES Quarterly Report
Donald R. Wiesnet, Principal Investigator, David F. McGinnis, and Michael Matson 7 Dec. 1978 4 p ERTS
(NASA-CR-157917; QR-5) Avail: NTIS HC A02/MF A01 CSCL 08H

There are no author-identified significant results in this report.

N79-13472*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF MULTISPECTRAL SCANNER DATA TO THE STUDY OF AN ABANDONED SURFACE COAL MINE
Ernie W. Spisz Nov. 1978 80 p refs Original contains color

illustrations
(NASA-TM-78912; E-9647) Avail: NTIS HC A05/MF A01 CSCL 08I

The utility of aircraft multispectral scanner data for describing the land cover features of an abandoned contour-mined coal mine is considered. The data were obtained with an 11 band multispectral scanner at an altitude of 1.2 kilometers. Supervised, maximum-likelihood statistical classifications of the data were made to establish land-cover classes and also to describe in more detail the barren surface features as they may pertain to the reclamation or restoration of the area. The scanner data for the surface-water areas were studied to establish the variability and range of the spectral signatures. Both day and night thermal images of the area are presented. The results of the study show that a high degree of statistical separation can be obtained from the multispectral scanner data for the various land-cover features. G.G.

N79-13473*# San Jose State Coll. Foundation, Calif. Dept. of Geology.
A STUDY TO EXAMINE THE FEASIBILITY OF USING SURFACE PENETRATORS FOR MINERAL EXPLORATION Final Technical Report, May 1977 - Dec. 1978
Alice S. Davis and David W. Anderson Dec. 1978 49 p refs
(Grant NsG-2236)
Avail: NTIS HC A03/MF A01 CSCL 08G

The feasibility of using penetrators in earth applications is examined. Penetrator applications in exploration for mineral resources only is summarized. Instrumentation for future penetrators is described. Portions of this report are incorporated into a more extensive report examining other penetrator applications in exploration for fossil fuels, geothermal resources, and in environmental and engineering problems, which is to be published as a NASA technical publication. G.Y.

N79-13474*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A SYNOPTIC DESCRIPTION OF COAL BASINS VIA IMAGE PROCESSING Interim Technical Report
K. Winslow Farrell, Jr. and David B. Wherry Sep. 1978 38 p refs
(Contracts NAS7-100; ET-76-01-9036)
(NASA-CR-157970; JPL-Pub-78-82; FE/9036-3) Avail: NTIS HC A03/MF A01 CSCL 08G

An existing image processing system is adapted to describe the geologic attributes of a regional coal basin. This scheme handles a map as if it were a matrix, in contrast to more conventional approaches which represent map information in terms of linked polygons. The utility of the image processing approach is demonstrated by a multiattribute analysis of the Herrin No. 6 coal seam in Illinois. Findings include the location of a esource and estimation of tonnage corresponding to constraints on seam thickness, overburden, and Btu value, which are illustrative of the need for new mining technology. Author

N79-13475*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EULUSMAP: AN INTERNATIONAL LAND RESOURCES MAP UTILIZING SATELLITE IMAGERY
T. Paludan and E. Csati (Inst. of Surveying and Mapping, Budapest) Dec. 1978 20 p refs
(NASA-TP-1371; M-271) Avail: NTIS HC A02/MF A01 CSCL 08B

In 1972, the International Geographical Union's Commission on World Land Use Survey adopted a project for a land-use map of Europe. Such a map, under the name Eulusmap was started earlier under sponsorship of several government offices in Hungary. Although there was great response from a number of contributors in many countries, it became evident by mid-1974 that the map would contain gaps and some inaccuracies unless additional data sources were utilized. By then, the satellite Landsat-1 had obtained imagery of most of Europe. Using theme extraction techniques, the map was completed in draft form and portions of it displayed at the 23d International Geographical Congress in Moscow during July 1976. Printing of the completed map was accomplished in May 1978. Author

N79-13476*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE BRIGHTNESS OF POLAR FIRN AS MEASURED BY NIMBUS 5 AND 6 ESMR
A. T. C. Chang, B. J. Choudbury, and P. Gloersen Oct. 1978 20 p refs Submitted for publication
(NASA-TM-79662) Avail: NTIS HC A02/MF A01 CSCL 08L

The microwave emission from a half-space medium characterized by coordinate dependent scattering and absorbing centers was calculated by numerically solving the radiative transfer equation by the method of invariant imbedding. A Mie scattering phase function and surface polarization was included in the calculation. Also included are the physical temperature profile and the temperature variation of the index of refraction for ice. Using published values of grain size and temperature profile data of polar firn, the brightness temperature was calculated for the 1.55 cm and 0.8 cm wavelengths. For selected regions in Greenland and Antarctica, the results are in reasonable agreement with the observed Nimbus-5 and Nimbus-6 ESMR data. Author

N79-13477*# Naval Research Lab., Washington, D. C. Advanced Space Sensing Application Branch.
REMOTELY SENSED WAVE SPECTRA FROM JOINT NORTH SEA EXPERIMENTS 2 Final Report
Davidson T. Chen Aug. 1978 44 p refs
(NASA Order P-45823-G)
(NASA-CR-157628; AD-A058711; NRL-MR-3808) Avail: NTIS HC A03/MF A01 CSCL 08/3

The amount of available remotely sensed wave data, obtained by a Helium-Neon laser profilometer in Joint North Sea Experiment 2 (JONSWAP 2), has been quite limited because the signal emitted from the laser profilometer, to say the least, was very noisy throughout the whole airborne experiment. Fortunately, among the very few flights whose data was relatively less noisy, steady offshore wind conditions were found to exist for the single flight on September 19, 1973. Wave spectra calculated form wave data obtained by this particular flight are presented in this report. Due to the lack of strong current gradients in the experiment area, the feasibility of inferring currents by using the technique proposed by Huang, et al. (1972) could not be appropriately investigated. However, this particular technique has been included in this report as an Appendix for reference purposes. Author (GRA)

N79-13478# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geological Sciences.
EVALUATION AND TARGETING OF GEOTHERMAL ENERGY RESOURCES IN THE SOUTHEASTERN UNITED STATES Progress Report, 1 Oct. - 31 Dec. 1977
J. K. Costain, L. Glover, III, and Sinha A. Krishna 1977 174 p refs
(Contract ET-78-C-05-5648)
(VPI-SU-5648-1) Avail: NTIS HC A08/MF A01

Progress in the evaluation of low-temperature geothermal resources in the eastern United States utilizing geological, geochemical, and geophysical data is reported. Primary programmatic emphasis is now being placed on the confirmation of radiogenic resources beneath sediments of the Atlantic Coastal Plain. The purpose of this study is to determine the relationship of the Rolesville, N. C. batholith to the surrounding country rocks, and to provide a geologic base for the geophysical interpretation of Piedmont stratigraphy underlying Atlantic Coastal Plain sediments to the east. DOE

N79-13479# Oak Ridge Gaseous Diffusion Plant, Tenn.
WIDE-SPACED URANIUM GEOCHEMICAL SURVEY IN THE PLAINVIEW, LUBBOCK, AND BIG SPRING QUADRANGLES, TEXAS
C. E. Nichols, T. R. Butz, G. W. Cagle, and V. E. Kane 30 Dec. 1977 411 p refs
(Contract W-7405-eng-26)
(K/UR-10; GJBX-73(78)) Avail: NTIS HC A18/MF A01

Stream sediment, stream water, and groundwater were analyzed for about 25 parameters. Ratio of total U to acid-leachable U is used to interpret anomalous values of U in stream sediments. High values of U, Cr, Mn, Ti, V, and Zr in stream sediments may be attributed to heavy minerals. Based on this concept and considering other elements indicative of sandstone uranium mineralization, the most interesting area indicated by stream sediments is in the Big Spring Quadrangle. In stream

waters, U, Se, As, V, Mo, and B suggest that the most favorable area is in the western part of the Lubbock and Big Spring Quadrangles. The eastern half of the Lubbock and Plainview Quadrangles contain areas of marginal favorability. In groundwater, U, As, Mo, Se, bicarbonate, and V also indicate a favorable area in the western part of the Lubbock and Big Spring Quadrangles. North of this is an area of secondary favorability in the Plainview Quadrangle. DOE

N79-13480# California Univ., Berkeley. Lawrence Berkeley Lab.
GEOTHERMAL EMISSIONS DATA BASE: CERRO PRIETO GEOTHERMAL FIELD
S. R. Schwartz, comp. Apr. 1978 298 p
(Contract W-7405-eng-48)
(UCID-4033) Avail: NTIS HC A13/MF A01

A new data base subset on the gaseous emissions from the Cerro Prieto geothermal field is presented. Properties and states of the reservoir fluid such as flow rates, wellhead pressure, and enthalpy are included in the file along with the well name and constituent measurement. This subset is the result of an initial screening of the data covering 1967 to 1969, and new additions will be appended periodically to the file. The data are accessed by a data base management system as are all other subsets in the file. Data output is available in the form of numerical compilations or graphical displays disposed to paper, film, or magnetic tape. DOE

N79-13481*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 3 WORLD STANDARD CATALOG, 1-31 AUGUST 1978
Aug. 1978 270 p
(NASA-TM-79492; GSFC/LWC3-78/08; NTISUB/D/277-008) Avail: NTIS HC A12/MF A01 CSCL 05B

Imagery acquired by LANDSAT 3 which was processed and input to the data files during the referenced month is listed. Data, such as data acquired, cloud cover, and image quality are given for each scene. The microfilm roll and frame on which the scene maybe found is also given. G.G.

N79-13482*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 2 WORLD STANDARD CATALOG, 1-31 AUGUST 1978
Aug. 1978 173 p
(NASA-TM-79491; GSFC/LWC2-78/08; NTISUB/D/276-008) Avail: NTIS HC A08/MF A01 CSCL 05B

Imagery acquired by LANDSAT 2 which was processed and input to the data files during the referenced month is listed. Data, such as data acquired, cloud cover, and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. G.G.

N79-13483# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. SUMMARY REPORT
13 Apr. 1978 58 p
(PB-285746/4) Avail: NTIS HC A04/MF A01 CSCL 13B

A specific problem analysis was conducted by regional sponsors, one from 21 water resources regions. State and regional viewpoints about the following were examined: (1) existing and future water related problems; (2) conflicts associated with meeting state and regional objectives; and (3) issues needing resolution. B.B.

N79-13484# Utah Water Research Lab., Logan.
SALINITY MANAGEMENT OPTIONS FOR THE COLORADO RIVER. DAMAGE ESTIMATES AND CONTROL PROGRAM IMPACTS
Jay C. Andersen, Alan P. Kleinman, F. Bruce Brown, Joel R. Cannon, Ralph C. Darge, Larry Eubanks, W. T. Franklin, Charles W. Howe, Ernest B. Jackson, K. L. Leathers et al Jun. 1978 366 p refs
(Contract DI-14-31-0001-4168)
(PB-285482/6; UWRL-P-78-003; W78-10735; OWRT-B-107-UTAH(2)) Avail: NTIS HC A16/MF A01 CSCL 13B

Rivers draining arid basins increase in salinity content in the downstream area to the point where water users are often significantly damaged. The problem in some cases can be ameliorated by altering upstream water and land use practices. An economic trade-off exists between the cost of such upstream efforts and the downstream benefits achieved. Additional information is provided to estimate (1) economic damages caused by various salt concentrations to agricultural and municipal water users and (2) economic costs of salinity control measures by upstream water users. Damages were estimated for high salinity levels to provide guidelines to project future conditions. Control costs were estimated with a physical model developed to predict the response of soil, water, and crop factors. Input-output models were used to estimate indirect economic impacts. GRA

N79-13485# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data Service.
ICEBERGS FOR USE AS FRESH WATER
Jul. 1978 12 p
(PB-285664/9; CIO-78/1) Avail: NTIS HC A02/MF A01 CSCL 13B

Over three quarters of the earth's supply of freshwater is locked up in polar ice. Recent estimates have indicated that this water can be made available for use at 20 to 50% of the cost of desalination of seawater. Ice is used in locating and transporting huge icebergs from the Antarctic and mooring them offshore near water-deficient areas. A single iceberg could supply 1 million acre-feet of water -- enough to satisfy 10 million urban users or irrigate 600 square miles of land for 1 year. Its minimum value would be $20 million. Though possible with existing technology, the handling of fragile, melting ice masses on the order ot 100 million tons (200 times the weight of the largest supertankers) presents substantial problems. The environmental effects and legal responsibilities involved in transporting icebergs and locating them offshore are considered. GRA

N79-13486# Montana Univ., Missoula. Dept. of Geology.
FIELD TESTING AND ADAPTATION OF A METHODOLOGY TO MEASURE (IN STREAM) VALUES IN THE TONGUE RIVER, NORTHERN GREAT PLAINS (NGP) REGION - EXECUTIVE SUMMARY Final Report
Ken Bovee, James Gore, and Arnold Silverman Apr. 1978 35 p refs
(Contract EPA-68-01-2653)
(PB-284843/0; EPA-908/4-78-004B) Avail: NTIS HC A03/MF A01 CSCL 08H

A comprehensive, multi-component in-stream flow methodology was developed and field tested in the Tongue River in southeastern Montana. The methodology incorporates a sensitivity for the flow requirements of a wide variety of in-stream uses, and the flexibility to accommodate seasonal and subseasonal changes in the flow requirements for different uses. In-stream flow requirements were determined by additive independent methodologies developed for: (1) fisheries--including spawning, rearing and food production; (2) sediment transport; (3) mitigation of adverse impacts of ice; and (4) evapotranspiration losses. Consideration of a single in-stream flow requirement is inadequate since flow requirements for each use varied throughout the year. GRA

N79-13487# Geological Survey, Trenton, N. J. Resources Div.
WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1977. VOLUME 1: ATLANTIC SLOPE BASINS, HUDSON RIVER TO CAPE MAY Annual Report, 1 Oct. 1976 - 30 Sep. 1977
Jun. 1978 505 p refs
(PB-284672/3; USGS/WRD/HD-78/027-Vol-1; USGS/WDR/NJ-77/1-Vol-1) Avail: NTIS HC A22/MF A01 CSCL 13B

Water resources data for the 1977 water year for New Jersey consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. Subjects covered include: discharge records for 66 gaging stations; tide summaries for 7 stations; stage and contents for 15 lakes and reservoirs; water quality for 37 gaging stations, 159 partial-record flow stations, 1 reservoir, and 147 wells;

and water levels for 11 observation wells. Also included are 50 crest-stage partial-record stations and 45 low-flow partial-record stations. GRA

N79-13488# Geological Survey, Boston, Mass. Water Resources Div.
WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1977 Annual Report, 1 Oct. 1976 - 30 Sep. 1977
May 1978 323 p
(PB-284977/6; USGS/WRD/HD-78/020; USGS/WDR/MA/RI-77/1) Avail: NTIS HC A14/MF A01 CSCL 13B

Water resources data for the 1977 water year for Massachusetts and Rhode Island consist of records of stage, discharge, and water quality of streams; contents of lakes and reservoirs; and ground-water levels. Discharge records for 109 gaging stations, monthend contents for 15 lakes and reservoirs, water quality for 23 gaging stations, and water levels for 110 observation wells are presented. Data for 22 crest-stage partial-record stations are included. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating state and Federal agencies in Massachusetts and Rhode Island. GRA

N79-13489# National Technical Information Service, Springfield, Va.
LAND USE IN URBAN AREAS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Sep. 1975 - Sep. 1978
Carolyn A. Shonyo Oct. 1978 219 p Supersedes NTIS/PS-77/0928; NTIS/PS-76/0765; NTIS/PS-75/656
(NTIS/PS-78/1117/7; NTIS/PS-77/0928; NTIS/PS-76/0765; NTIS/PS-75/656) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

Research reports are cited on various aspects of urban land use including transportation planning, water resource management, air pollution, and land use zoning. This bibliography contains 212 abstracts. GRA

N79-13995# Joint Publications Research Service, Arlington, Va.
OCEAN OBSERVATION FROM SPACE
A. Bolshakov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 61-64 Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 9, 1978 p 32-33 (For primary document see N79-13989 04-99) Copyright. Avail: NTIS HC A05/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N79-13490*# Naval Weapons Support Center, Crane, Ind.
BLOCK 2 SOLAR CELL MODULE ENVIRONMENTAL TEST PROGRAM
Kevin L. Holloway Oct. 1978 56 p refs
(NASA Order C-1892-D; Contract E(49-26)-1022)
(NASA-CR-159393; DOE/NASA/1892-78/1; WQEC/C-78-224) Avail: NTIS HC A04/MF A01 CSCL 10A

Environmental tests were performed of on 76 solar cell modules produced by four different manufacturers. The following tests were performed: (1) 28 day temperature and humidity; (2) rain and icing; (3) salt fog; (4) sand and dust; (5) vacuum/steam/pressure; (6) fungus; (7) temperature/altitude; and (8) thermal shock. Environmental testing of the solar cell modules produced cracked cells, cracked encapsulant and encapsulant delaminations on various modules. In addition, there was some minor cell and frame corrosion. G.Y.

N79-13491*# Copper Development Association, Inc., New York, N. Y.
INSTRUMENTATION AT THE DECADE 80 SOLAR HOUSE IN TUCSON, ARIZONA Collation of Monthly Reports, May - Sep. 1978
Oct. 1978 8 p
(Contract NAS8-32244)
(NASA-CR-150851) Avail: NTIS HC A02/MF A01 CSCL 10A

Modifications, problems and solutions for the instrumentation system that occurred during the period from May through September, 1978, are described. The solar house was built to show the use of copper in home building and to demonstrate the use of solar energy to provide space heating and cooling and domestic hot water. The auxiliary energy sources are electrical resistance heating for the domestic hot water and a gas-fired boiler for space heating and operation of the adsorption air conditioning units. G.G.

N79-13492*# Wyle Labs., Inc., Huntsville, Ala. Solar Energy Systems Div.
LARGO HOT WATER SYSTEM LONG RANGE THERMAL PERFORMANCE TEST REPORT, ADDENDUM
Nov. 1978 19 p refs Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150842) Avail: NTIS HC A02/MF A01 CSCL 10A

The test procedure used and the test results obtained during the long range thermal performance tests of the LARGO Solar Hot Water System under natural environmental conditions are presented. Objectives of these tests were to determine the amount of energy collected, the amount of power required for system operation, system efficiency, temperature distribution, and system performance degradation. S.B.S.

N79-13493*# Wyle Labs., Inc., Huntsville, Ala. Solar Energy Systems Div.
LONG-TERM WEATHERING EFFECTS ON THE THERMAL PERFORMANCE OF THE LENNOX/HONEYWELL (LIQUID) SOLAR COLLECTOR
Nov. 1978 13 p refs Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150818) Avail: NTIS HC A02/MF A01 CSCL 10A

The test procedures used and the results obtained during the evaluation test program of the Lennox/Honeywell double covered liquid solar collector. The tests were performed under simulated conditions, following long-term exposure to natural weathering conditions. The Lennox/Honeywell collector is a flat-plate solar collector. The absorber plate is steel with copper tubes bonded on the upper surface, and is coated with black chrome. Visual inspection of the collector indicated slight discoloration of the absorber plate. Results indicate that performance degradation had occurred. Absorptivity and/or transmissivity decreased as a result of the weathering. S.B.S.

N79-13494*# Wyle Labs., Inc., Huntsville, Ala. Solar Energy Systems Div.
LIBBEY-OWENS-FORD SOLAR COLLECTOR STATIC LOAD TEST
Dec. 1978 6 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150852) Avail: NTIS HC A02/MF A01 CSCL 10A

The test article is a flat plate solar collector that uses liquid as the heat transfer medium. The absorber plate is copper and has a double tempered glass cover. Test requirements and procedures are described and results are presented in a table. Results demonstrate that the collector performed satisfactorily. S.B.S.

N79-13495*# Elcam, Inc., Santa Barbara, Calif.
PROTOTYPE SOLAR-HEATED HOT WATER SYSTEMS AND

DOUBLE-WALLED HEAT EXCHANGERS Progress Report, Jan. - Sep. 1978
Oct. 1978 11 p Prepared for DOE
(Contract NAS8-32245)
(NASA-CR-150854) Avail: NTIS HC A02/MF A01 CSCL 10A

Development progress made on two solar-heated hot water systems and two heat exchangers is reported. The development, manufacture, installation, maintenance, problem resolution, and system evaluation are described. S.B.S.

N79-13496*# General Electric Co., Santa Barbara, Calif. TEMPO
CONCEPTUAL DESIGN OF THERMAL ENERGY STORAGE SYSTEMS FOR NEAR TERM ELECTRIC UTILITY APPLICATIONS. VOLUME 1: SCREENING OF CONCEPTS
W. Hausz, B. J. Berkowitz, and R. C. Hare Oct. 1978 266 p Sponsored in part by Electric Power Research Inst. 2 Vol.
(Contracts DEN-3-12; EC-77-A-31-1034)
(NASA-CR-159411-Vol-1; GE78TMP-60-Vol-1; DOE/NASA/0012-78/1-Vol-1; EPRI-RP1082-1-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 10C

Over forty thermal energy storage (TES) concepts gathered from the literature and personal contacts were studied for their suitability for the electric utility application of storing energy off-peak discharge during peak hours. Twelve selections were derived from the concepts for screening; they used as storage media high temperature water (HTW), hot oil, molten salts, and packed beds of solids such as rock. HTW required pressure containment by prestressed cast-iron or concrete vessels, or lined underground cavities. Both steam generation from storage and feedwater heating from storage were studied. Four choices were made for further study during the project. Economic comparison by electric utility standard cost practices, and near-term availability (low technical risk) were principal criteria but suitability for utility use, conservation potential, and environmental hazards were considered. Author

N79-13497*# General Electric Co., Santa Barbara, Calif. TEMPO.
CONCEPTUAL DESIGN OF THERMAL ENERGY STORAGE SYSTEMS FOR NEAR TERM ELECTRIC UTILITY APPLICATIONS. VOLUME 2: APPENDICES - SCREENING OF CONCEPTS
W. Hausz, B. J. Berkowitz, and R. C. Hare Oct. 1978 144 p refs Sponsored in part by Electric Power Research Inst. 2 Vol.
(Contracts DEN-3-12; EC-77-A-31-1034)
(NASA-CR-159411-Vol-2; GE78TMP-60-Vol-2; DOE/NASA/0012-78/1-Vol-2; EPRI-RP1082-1-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 10C

Volume 2 of this 2 volume report is represented. This volume contains three appendices: (1) bibliography and cross references; (2) taxonomy - proponents and sources; and (3) concept definitions. G.Y.

N79-13498*# Solaron Corp., Denver, Colo. Solaron Energy Systems.
PROTOTYPE SOLAR HEATING AND COOLING SYSTEMS INCLUDING POTABLE HOT WATER Quarterly Reports
Oct. 1978 35 p Prepared for DOE
(Contract NAS8-32249)
(NASA-CR-150850) Avail: NTIS HC A03/MF A01 CSCL 10A

These combined quarterly reports summarize the activities from November 1977 through September 1978, and over the progress made in the development, delivery and support of two prototype solar heating and cooling systems including potable hot water. The system consists of the following subsystems: solar collector, auxiliary heating, potable hot water, storage, control, transport, and government-furnished site data acquisition. Author

N79-13499*# IBM Federal Systems Div., Huntsville, Ala.
SIMS PROTOTYPE SYSTEM 4 - PERFORMANCE TEST REPORT
9 Oct. 1978 130 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150820) Avail: NTIS HC A07/MF A01 CSCL 10B

A self-contained, preassembled air type solar system, designed for installation remote from the dwelling, to provide space heating and hot water was evaluated. Data analysis is included which documents the system performance and verifies its suitability for field installation. G.G.

N79-13500*# Wyle Labs., Inc., Huntsville, Ala. Solar Energy Systems Div.
LARGO HOT WATER SYSTEM THERMAL PERFORMANCE TEST REPORT
Nov. 1978 35 p refs Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150841) Avail: NTIS HC A03/MF A01 CSCL 10A

The thermal performance tests and results on the LARGO Solar Hot Water System under natural environmental conditions is presented. Some objectives of these evaluations are to determine the amount of energy collected, the amount of energy delivered to the household as contributed by solar power supplied to operate the system and auxiliary power to maintain tank temperature at proper level, overall system efficiency and to determine temperature distribution within the tank. The Solar Hot Water system is termed a Dump-type because of the draining system for freeze protection. The solar collector is a single glazed flat plate. An 82-gallon domestic water heater is provided as the energy storage vessel. Water is circulated through the collector and water heater by a 5.3 GPM capacity pump, and control of the pump motor is achieved by a differential temperature controller. Author

N79-13501*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PARAMETRIC STUDY OF TWO PLANAR HIGH POWER FLEXIBLE SOLAR ARRAY CONCEPTS
J. A. Garba, D. A. Kudija, B. Zeldin, and E. N. Costogue 15 Dec. 1978 586 p refs
(Contract NAS7-100)
(NASA-CR-157841; JPL-Pub-78-95) Avail: NTIS HC A25/MF A01 CSCL 10A

The design parameters examined were: frequency, aspect ratio, packaging constraints, and array blanket flatness. Specific power-to-mass ratios for both solar arrays as a function of array frequency and array width were developed and plotted. Summaries of the baseline design data, developed equations, the computer program operation, plots of the parameters, and the process for using the information as a design manual are presented. G.G.

N79-13502# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
AN ASSESSMENT OF THERMAL ENERGY STORAGE AND WASTE HEAT DISSIPATION WITH TOTAL ENERGY SYSTEMS FOR MIT M.S. Thesis
James Duane Palmer Feb. 1978 184 p refs
(AD-A059061) Avail: NTIS HC A09/MF A01 CSCL 10/2

Total energy systems have been proposed for installation at M.I.T. Competing power plant configurations based on three different prime movers; steam turbine, gas turbine, and internal combustion engine are analyzed to determine their coincident electrical and thermal power generation capacities. Power generation and demand profiles are compared and methods to match these profiles are formulated. Thermal energy storage is considered as a means of decoupling the thermal power production and demand. The waste heat rejected from each plant configuration is determined. Systems for dissipation of this waste heat are addressed and evaluated to determine their applicability at the M.I.T. site. Configurations incorporating each of the prime movers with an optimal waste heat dissipation system are proposed for detailed simulation of operation and cost comparison.
Author (GRA)

N79-13503# American Univ., Washington, D. C.
DEFINITION OF CHEMICAL AND ELECTROCHEMICAL PROPERTIES OF A FUEL CELL ELECTROLYTE Interim Technical Report, 25 Dec. 1977 - 24 Jul. 1978
T. Sarada and John F. McIntyre Jul. 1978 43 p refs
(Contract DAAK70-77-C-0080; DA Proj. 1L1-61102-AH-51)
(AD-A058795) Avail: NTIS HC A03/MF A01 CSCL 10/2

The present research is oriented toward the task of developing an improved electrolyte for the hydrocarbon-air fuel cell. The following compounds are being evaluated as potential fuel cell electrolytes: sulfoacetic acid, methane sulfonic acid, sulfosalicylic acid, 10-camphorsulfonic acid-dl, benzene sulfonic acid, ethylene disulfonic acid-dl, benzene sulfonic acid, ethylene disulfonic acid, 1,3,6-naphthalene trisulfonic acid, sulfosuccinic acid, sulfopropionic acid, ethane suflonic acid, methane disulfonic acid, and propane sulfonic acid. These compounds are being evaluated in terms of their ionic conductivities, vapor pressures, surface properties, chemical stabilities, and electrochemical behaviors. The present status of the project and the outstanding problems are reviewed. Author (GRA)

N79-13504# Army Electronics Command, Fort Monmouth, N. J. Electronics Technology/Devices Lab.

IMPROVED ANODES FOR LIQUID HYDROCARBON FUEL CELL

John Perry Apr. 1978 17 p ref
(DA Proj. 1S7-62705-AH-94)
(AD-A058456; DELET-TR-78-8) Avail: NTIS HC A02/MF A01 CSCL 10/2

Low power fuel cells operating on liquid hydrocarbons, such as methanol and ethylene glycol, have received renewed attention. The current state-of-the-art of anodes used in liquid hydrocarbon fuel cells operating at ambient temperatures of 22 C consist of platinum and palladium catalyst loadings of approximately 10 mg/sq cm. The cost and quantity of these noble metals required for anode electrode fabrication are high. Investigations conducted to reduce the noble metal catalyst loadings have lead to the development of an electrode consisting of graphite, platinum (2.4 mg/sq cm), and anodic lead dioxide. Cells fabricated with the new anode (graphite, platinum, and lead dioxide) and silver amalgam cathodes were capable of operating at current densities of 20 mA/sq cm at 0.60 V when charged with an anolyte solution of either methanol in potassium hydroxide or ethylene glycol in potassium hydroxide. Author (GRA)

N79-13505# General Electric Co., Wilmington, Mass.

EVALUATION AND OPTIMIZATION OF SOLID POLYMER ELECTROLYTE (SPE) FUEL CELLS Final Technical Report, 23 May 1977 - 23 April 1978

Edward N. MacLeod and James E. McElroy 15 May 1978 45 p
(Contract DAAK70-77-C-0128)
(AD-A058380; MPR-022) Avail: NTIS HC A03/MF A01 CSCL 10/2

The reaction air of a fuel/air solid polymer electrolyte (SPE) fuel cell was water saturated utilizing excess moisture in the fuel by diffusion thru an uncatalized portion of the SPE. This device eliminated the need for external humidification controls. Fuel/air current densities up to 750 ma/sq cm were demonstrated. Author (GRA)

N79-13506# Dubin-Bloome Associates, New York.

SOLAR ASSISTED HEAT PUMP STUDY FOR HEATING OF MILITARY FACILITIES Final Report, Jul. 1976 - Nov. 1977

Freddie L. Beason and Larry W. Strother Tyndall AFB, Fla. AFCEC Jul. 1978 203 p refs
(Contract F08635-76-C-0276)
(AD-A058626; AFCEC-TR-78-6) Avail: NTIS HC A10/MF A01 CSCL 13/1

This study identified 21 generic solar assisted heat pump systems and subjectively evaluated them. The six most promising systems were evaluated in further detail. A complete objective analysis of the two most promising systems was then made to determine which could be most economical to install in a family housing unit at Little Rock Air Force Base, Arkansas. The system chosen was a solar hot water heating system in parallel with a water source heat pump. Preliminary drawings intergrating this system into a family housing unit at Little Rock AFB were developed. The system selected had a 27-32 year pay back. Author (GRA)

N79-13507# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.

EVALUATION OF HIGH PERFORMANCE EVACUATED TUBULAR COLLECTORS IN A RESIDENTIAL HEATING AND COOLING SYSTEM: COLORADO STATE UNIVERSITY SOLAR HOUSE 1 Progress Report, 1 Oct. 1976 - 30 Sep. 1977

W. S. Duff, T. M. Conway, G. O. G. Meredith, and R. B. Pratt Mar. 1978 101 p
(Contract EY-76-S-02-2577)
(COO-2577-14) Avail: NTIS HC A06/MF A01

The CSU Solar House I is configured with a prototype Corning evacuated tubular collector and a lithium bromide water chiller designed for solar operation. Data were collected for this configuration since January 1977. An operating and control system for the configuration was developed and to the performance of the residential solar heating, cooling, and hot water system was compared with performance of the previous system. Many problems were encountered in the evolution of the operating and control systems due to the different operating characteristics of evacuated tubular collectors, such as their rapid thermal response and the possibility of much higher temperatures as compared to a flat plate collector. DOE

N79-13508# Chicago Univ., Ill.

INDUSTRIAL INTERNATIONAL DATA BASE: ENERGY ANALYSIS METHODOLOGY. RATIONAL USE OF ENERGY PROGRAM PILOT STUDY Final Report

1978 55 p refs
(Contract EX-76-C-10-3869)
(NATO/CCMS-75) Avail: NTIS HC A04/MF A01

The Industrial International Data Base Project represents an effort to provide information for the responsible development of energy resources and the allocation of energy research and development funds in industry. The Data Base Project and its organizational history are described. The recommendations of the methodology experts' group are reported along with brief justifications. The general outline and discussion of the recommended method of analyzing total energy use are provided. It is directed at industrial managers, government officials, and potential energy analysts who are unfamiliar with the techniques and inherent difficulties of such assessments. Detailed examinations of more technical aspects of the analyses, exhibits that compare total sectoral energy use in selected countries, a list of documents published under the auspices of the Data Base Project, and a list of attendees at the experts' meetings are included. DOE

N79-13509# Bechtel Corp., San Francisco, Calif.

DESIGN OF LOW-COST STRUCTURES FOR PHOTOVOLTAIC ARRAYS. TASK 1: SURVEY OF ARRAY STRUCTURAL CHARACTERISTICS

Feb. 1978 60 p refs
(Contract EY-76-C-04-0789)
(SAND-78-7021) Avail: NTIS HC A04/MF A01

In developing design concepts for low cost photovoltaic arrays structural details and functions, manufacturing capability, installation methods, and the maintenance of operating systems are considered. So much is involved in establishing feasible support concepts that it is important to determine the evolution of existing solar array support designs as presently installed or conceptualized by manufacturers. A data base for solar collector systems using existing sources of information was established. Technical literature was surveyed, and solar industry manufacturers were surveyed by mail and telephone to acquire basic data about their products. Companies that make either thermal or photovoltaic collectors were included in the survey listings and company names continue to be added. The nonsolar industry was contacted as well because of the potential for including their knowledge and experience. Results of the surveys and visits are discussed. DOE

N79-13510# General Electric Co., Philadelphia, Pa. Space Div.

APPLIED RESEARCH ON ENERGY STORAGE AND CONVERSION FOR PHOTOVOLTAIC AND WIND ENERGY SYSTEMS. VOLUME 2: PHOTOVOLTAIC SYSTEMS WITH ENERGY STORAGE Final Report

Jan. 1978 344 p refs Sponsored in part by DOE
(Contract NSF C-75-22221-01)
(HCP/T22221-01/2-2) Avail: NTIS HC A15/MF A01

Energy storage technologies deemed best suited for use in conjunction with a photovoltaic energy conversion system in utility,

residential and intermediate applications are evaluated. Break-even cost goals are developed for several storage technologies in each application. These break-even costs are then compared with cost projections to show technologies and time frames of potential economic viability. The results, conclusions and recommendations pertaining to use of energy storage with photovoltaic energy conversion systems are given. Candidate storage concepts studied include: (1) above ground and underground pumped hydro; (2) underground compressed air; (3) electric batteries; (4) flywheels, and (5) hydrogen production and storage. DOE

N79-13511# General Electric Co., Philadelphia, Pa. Space Div.
APPLIED RESEARCH ON ENERGY STORAGE AND CONVERSION FOR PHOTOVOLTAIC AND WIND ENERGY SYSTEMS. VOLUME 1: STUDY SUMMARY AND CONCEPT SCREENING Final Report
Jan. 1978 227 p refs Sponsored in part by DOE
(Contract NSF C-75-22221-01)
(HCP/T22221-01/1-Vol-1) Avail: NTIS HC A11/MF A01

Storage technologies, particularly those which might be best suited for use in conjunction with wind and photovoltaics, were reviewed. The potential worth added by incorporating storage was extensively analyzed for both wind and photovoltaics. Energy storage concepts studied include: (1) above ground pumped hydro storage; (2) underground pumped hydro storage; (3) thermal storage oil; (4) thermal storage steam; (5) underground compressed air storage; (5) pneumatic storage; (7) lead acid batteries; (8) advanced batteries; (9) inertial storage (flywheel); (10) hydrogen generation and storage; and (11) superconducting magnetic energy storage. Results, conclusions, and recommendations of the investigations are presented. DOE

N79-13512# Midwest Research Inst., Kansas City, Mo.
SOLAR HEATING AND COOLING OF BUILDINGS (SHACOB) COMMERCIALIZATION REPORT. PART A: OPTIONS AND STRATEGIES. VOLUME 1: EXECUTIVE SUMMARY
May 1978 40 p
(Contract EM-77-C-01-8727)
(HCP/M70065-01/1) Avail: NTIS HC A03/MF A01

Potential barriers to the commercialization of solar heating and cooling of buildings in the residential and commercial sectors are analyzed, and government incentives that could accelerate the commercialization process are investigated. Solar hot water and space heating are emphasized. DOE

N79-13513# Little (Arthur D.), Inc., Cambridge, Mass.
SOLAR HEATING AND COOLING OF BUILDINGS (SHACOB) COMMERCIALIZATION REPORT. PART B: ANALYSIS OF MARKET DEVELOPMENT. VOLUME 2
May 1978 88 p refs
(HCP/M70066-01/2) Avail: NTIS HC A05/MF A01

The SHACOB Commercialization Model is designed to gauge the impacts of selected federal incentive programs to encourage the development of solar energy equipment for hot water heating, space heating, and space cooling in residential and commercial buildings. The origin of the major economic and technical data base elements used in the model are discussed and trends of these elements are projected over the time frame. The status of the solar industry is reviewed briefly. The results of the SHACOB Model analysis are discussed in the following areas: a comparison of the four major incentive scenarios, the sensitivity of the SHACOB Model to key data assumptions, the impact of single incentives (versus incentive packages), a comparative view of the National Energy Plan (NEP) projections versus the COMP/NEP approach, and a brief investigation of possible phased incentive programs designed to avoid the disruptive effects resulting from the sudden termination of major incentives. DOE

N79-13514# Princeton Combustion Lab., N. J.
THE DEFINITION OF A NATIONAL PROGRAM IN ENERGY-EFFICIENT PUMP UTILIZATION, VOLUME 1 Final Report, 10 May 1976 - 9 Mar. 1977
Jun. 1978 114 p refs
(Contract EY-76-C-03-1260)
(HCP/W1260-01/1) Avail: NTIS HC A06/MF A01

Up to half of the energy consumed by industrial and commercial machinery estimated to go toward the movement of liquids by pumping equipment, the remainder being consumed by compressors, blowers, fans, machine tools, refrigeration, and so forth. The pumping of liquids is vital to almost every segment of the national economy. The majority of pumps used in the U.S. are of the centrifugal type. The efficiency of such a pump may be above 90 percent at best and below 10 percent at worst. Many pumps and pumping systems are known to operate at low efficiencies due to improper selection, lack of maintenance, and inefficient pump design. The current study was carried out to assess the magnitude of energy consumption by pumping equipment in the United States, to project the energy savings possible by appropriate measures, and to define a national program aimed at implementing these savings. DOE

N79-13515# Princeton Combustion Lab., N. J.
THE DEFINITION OF A NATIONAL PROGRAM IN ENERGY-EFFICIENT PUMP UTILIZATION. VOLUME 2: APPENDICES Final Report, 10 May 1976 - 9 Mar. 1977
Jun. 1978 236 p refs
(Contract EY-76-C-03-1260)
(HCP/W1260-01/2) Avail: NTIS HC A11/MF A01

The Appendices are entitled:(1) Auto coolant pump performance tests and results; (2) Future predictions of pump energy usage; (3) Electric power station downtime due to pumping problems; (4) Questionnaire survey of pump manufacturers and users, and analysis of pumping categories; (5) Methods of economic assessment of the shift to energy-efficient pumping systems; and (6) Survey of pumps in use and energy consumption in the U.S. DOE

N79-13516# Argonne National Lab., Ill.
COMPUTER PROGRAM FOR THE THERMAL ANALYSIS OF LEAD-ACID CELLS FOR LOAD-LEVELING APPLICATIONS
K. W. Choi and N. P. Yao May 1978 32 p refs
(Contract W-31-109-eng-38)
(ANL/OEPM-78-1) Avail: NTIS HC A03/MF A01

A mathematical model for the study of the temperature distribution in lead-acid cells designed for load-leveling applications is presented. The computer program derived to obtain the numerical solutions for this model is discussed. Modifications in the computer program to account for different cell conditions, such as forced water cooling at a cell terminal, are also presented. DOE

N79-13517# Department of Energy, Washington, D. C. Div. of Electric Energy Systems.
PROGRAM INFORMATION NOTICE
Jun. 1978 55 p
(DOE/ET-0059) Avail: NTIS HC A04/MF A01

Information on those technologies which are relevant and applicable to the systems aspects of U.S. electric energy systems is presented. Emphasis is placed on those research and development projects which are designed to: (1) ensure that all the elements of future electric energy systems are integrated as required to achieve an overall energy efficient system; (2) ensure the continued availability of the system's capability of delivering electrical energy from the source to the user as needed; (3) develop the system design and control techniques that will be required to accelerate the commercialization of emerging technologies with significant near-term energy benefits; and (4) meet the need for electric energy systems input for national energy policy planning. Environmental and socio-economic considerations are included. DOE

N79-13518# Department of Energy, Washington, D. C. Div. of Solar Technology.
SOLAR THERMAL POWER SYSTEMS PROGRAM: PROGRAM SUMMARY
Jan. 1978 170 p
(DOE/ET-0018/1) Avail: NTIS HC A08/MF A01

The accomplishments, projects, and plans of the program are summarized. The objectives of the program are accomplished through research, development, and demonstration in three program areas: (1) dispersed power applications, (2) central power applications, and (3) advanced thermal technology. Efforts in the dispersed power applications include (1) total energy systems, (2) small power systems, and (3) irrigation systems. The program

elements and their funping are tabulated. Summary sheets are included for all the projects. DOE

N79-13519# Department of Energy, Washington, D. C. Div. of Solar Applications Developments.
SOLAR HEATING AND COOLING. RESEARCH AND DEVELOPMENT: PROJECT SUMMARIES
May 1978 291 p
(DOE/CS-0010) Avail: NTIS HC A13/MF A01

The Conservation and Solar Applications Solar Heating and Cooling Research and Development Program is described. The evolution of the program is described and the present program is outlined. A series of project descriptions summarizes the research and development presently supported for further development of collectors, thermal energy storage and heat exchangers, heat pumps, solar cooling, controls, and systems. DOE

N79-13520# Los Alamos Scientific Lab., N. Mex.
VERIFICATION METHODOLOGY FOR THE DOE-1 BUILDING ENERGY ANALYSIS COMPUTER PROGRAM
S. C. Diamond, B. D. Hunn, and T. E. McDonald 1978 5 p refs Presented at the Systems Simulation and Econ. Analysis for Solar Heating and Cooling Conf., San Diego, Calif., 26-27 Jun. 1978
(Contract W-7405-eng-36)
(LA-UR-78-1493; Conf-780639-3) Avail: NTIS HC A02/MF A01

A computer program, DOE-1, was developed to provide architect/engineers with a public domain design tool for fast and economic energy analysis of buildings. This program can be used to rapidly analyze various design options, including several active solar heating/cooling configurations. It also produces life-cycle cost data, as well as thermal performance predictions. The verification for the real-system simulation of DOE-1 centers on the task of determining the range of applicability (limitations) of the model and the desired accuracy within this range. Tests include an analytical verification test and a field verification test designed to examine the DOE-1 program on an individual algorithm basis. Tasks in the project are listed. DOE

N79-13521# Los Alamos Scientific Lab., N. Mex.
COMPONENT-BASED SIMULATOR FOR SOLAR SYSTEMS
M. A. Roschke, B. D. Hunn, and S. C. Diamond 1978 5 p refs Presented at the Conf. on Systems Simulation and Econ. Analysis for Solar Heating and Cooling, San Diego, Calif., 27-29 Jun. 1978
(Contract W-7405-eng-36)
(LA-UR-78-1494; Conf-780639-4) Avail: NTIS HC A02/MF A01

The CBS program was designed as a module of the DOE-1 building energy analysis program package. The CBS program features are described and compared with TRNSYS. Sample results and output listing are shown. DOE

N79-13522# Sandia Labs., Albuquerque, N. Mex.
CONCENTRATING SOLAR COLLECTOR TEST RESULTS, COLLECTOR MODULE TEST FACILITY
V. E. Dudley (Edgerton, Germeshausen and Grier, Inc., Bedford, Mass.) and Robert M. Workhoven May 1978 52 p refs
(Contract EY-76-C-04-0789)
(SAND-78-0815) Avail: NTIS HC A04/MF A01

The results of tests on a series of five concentrating solar collectors from Suntec Systems, Inc., Hexcel Corporation; General Atomic Company; McDonnell Douglas Astronautics Company; and Solar Kinetics, Inc. are summarized. The Hexcel design performed better than the others primarily because of a highly reflective, precisely shaped mirror that focused almost all the reflected light onto the absorber. McDonnell Douglas, Suntec Systems, and Solar Kinetics designs were down about 10% in efficiency at temperatures near 300 C. The General Atomic FMSC performed at a lower level at low temperatures because of large reflected light spillover, but only about 3 to 4% lower than the others near operating temperatures of 300 C. DOE

N79-13523# Pacific-Sierra Research Corp., Santa Monica, Calif.
NON-ELECTRIC APPLICATIONS OF GEOTHERMAL ENERGY IN SIX ALASKAN TOWNS Final Report, Oct. 1976 - Nov. 1977
J. Farquhar, R. Grijalva, and P. Kirkwood Nov. 1977 243 p refs
(Contract EY-77-C-07-1622)
(IDO-1622-4) Avail: NTIS HC A11/MF A01

A major objective of this study was to stimulate development and use of the geothermal resource provided by the earth's average thermal gradient, as opposed to the few anomalies that are typically chosen for geothermal development. Hence, six towns for study were selected as being representative of remote Alaskan conditions. The moderate-temperature heat available almost everywhere at depths of two to four kilometers into the earth's mantle could satisfy a major portion of the nation's heating requirements but the cost must be reduced. DOE

N79-13524# Brookhaven National Lab., Upton, N. Y. Policy Analysis Div.
ANALYTICAL FRAMEWORK FOR THE ASSESSMENT OF ENERGY RESOURCE AND TECHNOLOGY OPTIONS FOR DEVELOPING COUNTRIES
Feb. 1978 23 p refs
(Contract EY-76-C-02-0016)
(BNL-50800) Avail: NTIS HC A02/MF A01

The potentials of various energy resource and technology options in meeting national economic and social development goals for developing countries are evaluated. Resource options are the development of various indigenous conventional resources such as oil, oil shale, natural gas, coal, uranium, hydropower, or geothermal energy. Technology options include advanced coal-combustion technologies, solar energy for water heating or crop drying, wind-driven irrigation pumps, and energy-efficient industrial processes. Two categories of option considered are: those that correspond to the accelerated implementation of existing elements of the energy system (such as oil-fired electricity generation), and those that correspond to the introduction of a new technology (such as solar electricity). The various resource and technology options are analyzed with respect to a number of parameters of concern, or objective functions, or payoff functions. Among the most prominent of these are the following: total fuel demand and fuel mix; oil imports and exports; national social goals; total energy costs; balance of payments; labor and capital requirements; and environmental quality. The basic approach is described. DOE

N79-13525# Brookhaven National Lab., Upton, N. Y.
SOME MEASURES OF REGIONAL-INDUSTRIAL INTERFUEL SUBSTITUTION POTENTIALS
E. J. Goettle, IV May 1978 43 p refs Presented at 53rd Conf. of the Western Econ. Assoc., Honolulu and Kona, Hawaii, 20 Jun. 1978
(Contract EY-76-C-02-0016)
(BNL-24368; Conf-780651-1) Avail: NTIS HC A03/MF A01

The potential for the substitution of coal for oil and gas in the manufacturing sector is assessed. Demand functions for the alternative energy inputs are derived from a general model of producer behavior. Data for the manufacturing sectors of thirty-three states for the years 1971, 1974, 1975 are pooled into three regional groupings. Two statistical specifications are then estimated. The first is predicted on the assumption that the response parameters are completely heterogeneous across the three regions. The second has regional equality imposed on the parameter estimates and is identical to the complete pooling of the observations. From the above, the regional interfuel substitution and demand elasticities are determined and comparatively examined. Potentially serious misinformation is shown to occur when completely pooled crossregional and time series data are used to estimate national (or subnational) average response parameters. DOE

N79-13526# Brookhaven National Lab., Upton, N. Y.
ENERGY SYSTEMS STUDIES PROGRAM Annual Report, Fiscal Year 1977
M. Beller, ed. Jan. 1978 100 p refs
(Contract EY-76-C-02-0016)
(BNL-50822) Avail: NTIS HC A05/MF A01

The Energy Systems Studies Program carried out for the Department of Energy (DOE) is summarized. Topics include the work done by the energy modeling and data group, the technology

assessment group, and the economic analysis division in support of DOE programs. The scope of work planned for FY 1978 is briefly described. DOE

N79-13527# Battelle Pacific Northwest Labs., Richland, Wash.
SITING HANDBOOK FOR SMALL WIND ENERGY CONVERSION SYSTEMS
H. L. Wegley, M. M. Orgill, and R. L. Drake May 1978 118 p refs
(Contract EY-76-C-06-1830)
(PNL-2521) Avail: NTIS HC A06/MF A01

A user's guide for proper site selection for small wind energy conversion systems is presented. Topics included are: (1) feasibility study, (2) system selection, (3) wind description, (4) environmental hazards, (5) flat terrain sites, (6) nonflat terrain sites, and (7) site analysis methods. DOE

N79-13528# Arizona Univ., Tucson. Optical Sciences Center.
OPTICAL DESIGN OF A SOLAR COLLECTOR FOR THE ADVANCED SOLAR THERMAL ELECTRIC CONVERSION/PROCESS HEAT PROGRAM
C. W. Chen, G. W. Hopkins, K. D. Masterson, A. B. Meinel, D. E. Osborn, O. N. Stavroudis, K. P. Thompson, and A. F. Turner Oct. 1977 223 p refs
(Contract W-7405-eng-26)
(Y/Sub-77/14261) Avail: NTIS HC A10/MF A01

A technical feasibility study was carried out for a concentrating solar collector system with receiver at ground level to result in an optical design carried out in sufficient detail to enable the sponsor to evaluate cost and potential for using its technology. Potential problem areas were identified. Several potential systems were considered, but one configuration, the tower reflector-concentrator, was the only one that met requirements at reasonable technological risk. This system was adopted for detailed development and analysis. Techniques for calculating the optical specifications were developed. A study of funnel concentrators, which required development of analytical tools and computer programs, and a review of materials and coatings for optical elements are included. DOE

N79-13529# Department of Energy, Washington, D. C. Div. of Solar Technology.
PHOTOVOLTAIC PROGRAM: PROGRAM SUMMARY
Jan. 1978 215 p
(DOE/ET-0019/1) Avail: NTIS HC A10/MF A01

The time-phased program goals and strategy are outlined, and the individual projects of the Photovoltaics Program during the Fiscal Year 1977 are summarized. A list of contractors is given, and an appendix on unsolicited proposal requirements is included. DOE

N79-13530# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
SOLAR EVACUATED TUBE COLLECTOR: ABSORPTION CHILLER SYSTEMS SIMULATION
J. A. Leflar and W. S. Duff Dec. 1977 92 p refs
(Contract EY-76-S-02-2577)
(COO-2577-13) Avail: NTIS HC A05/MF A01

A residential air conditioning system incorporating an absorption chiller and evacuated tube collectors is simulated and the design parameters studied. Mathematical models of the evacuated tube collector and absorption chiller based on experimental results of the components were created and incorporated into a complete system simulation. The chiller model includes transient start-up effects and the evacuated tube collector model includes numerous optical effects. A standard chiller in a humid climate (Washington, D. C.) and a unit with a modified charge for dry climates (Fort Collins, Colorado) are studied. Design parameters considered include the use of chilled water storage to reduce transient start-up effects of the absorption unit, the effects of removing heat from the solar system for preheating service hot water, the use of a tempering valve to prevent over-firing of the absorption unit in dry climates, and solar storage sizing considerations. A cooling system design is specified. DOE

N79-13531# Institute for Energy Analysis, Oak Ridge, Tenn.
THREE MODES OF ENERGY COST ANALYSIS: THEN-CURRENT DOLLARS, BASE-YEAR DOLLARS, AND PERPETUAL-CONSTANT DOLLARS
R. M. Harnett and D. L. Phung Jun. 1978 22 p refs
(Contract EY-76-C-05-0033)
(ORAU/IEA-78-10(M)) Avail: NTIS HC A02/MF A01

The cost analysis of energy supplied by a facility over its life cycle is complicated by inflation and by discount rates. Neglect of inflation and improper use of discount rates have often rendered elaborate cost calculations meaningless and have added to the great confusion as to the merits of competing technologies. It is shown in this paper that three modes of energy-cost calculations can be clearly distinguished by the manner in which inflation is treated. Each mode has a well-defined discount rate and is used in conjunction with a well-defined set of input data. A numerical example is provided for the cost comparison of several alternatives for supplying synthetic fuels. DOE

N79-13532# Sandia Labs., Albuquerque, N. Mex.
SOLAR IRRIGATION PROGRAM DATA BASE MANAGEMENT SYSTEM (SIPDBMS)
P. C. Kaestner May 1978 141 p refs
(Contract EX-76-C-04-0789)
(SAND-78-0641) Avail: NTIS HC A07/MF A01

A user's guide to (SIPDBMS) and the data bases available is presented. The code is described in some detail to make code modifications easier. SIPDBMS is operational on the CDC 6600. DOE

N79-13533# Ocean Data Systems, Inc., Monterey, Calif.
OTEC THERMAL RESOURCE REPORT FOR CENTRAL GULF OF MEXICO
Oct. 1977 111 p refs
(Contract EG-77-C-01-4028)
(TID-27951) Avail: NTIS HC A06/MF A01

Most probable monthly temperature profiles from surface to 1500-meter depths were developed for nineteen one-degree latitude-longitude squares in the Central Gulf of Mexico for Ocean Thermal Energy Conversion (OTEC) purposes. This part of the Gulf of Mexico is the site of a semi-permanent current system. An inventory summary of the temperature observations available in the area is included as well as overall bathymetric information. The monthly temperature data are provided in tabular form and as plots of delta T versus depth for each latitude-longitude square. DOE

N79-13534# Environmental Law Inst., Washington, D. C.
LEGAL BARRIERS TO SOLAR HEATING AND COOLING OF BUILDINGS
Mar. 1978 231 p refs
(Contract EX-76-C-01-2528)
(HCP/M2528-1) Avail: NTIS HC A11/MF A01

A study of the legal problems that may be encountered by commercial, industrial, and individual users of solar energy for heating and cooling is presented. The study consists primarily of a review of existing literature, and extensive lists of references are included. Topics by section include: (1) solar access and land use issues, (2) building codes, (3) home financing, (4) utilities, (5) mandatory installation, (6) ERDA patent policy, (7) antitrust and fostering competition, (8) labor union resistance and conflicts, (9) property taxes, (10) mobile homes, and (11) tort liability, insurance, and warranties. Author (DOE)

N79-13535# Department of Energy, Washington, D. C.
SOLAR ENERGY
Jun. 1978 59 p refs
(DOE/ET-0062) Avail: NTIS HC A04/MF A01

The current status and potential of solar energy is presented. Various public industrial, and government funded studies and developments are described. Economics and market penetration potential and White House issues memorandum are included. DOE

N79-13536# Public Technology, Inc., Washington, D. C.
PLANNING PROGRAM TO ACCELERATE ENERGY CONSERVATION IN MUNICIPALITIES Interim Report
Jul. 1978 80 p
(Contract EC-77-C-01-5017)
(HCP/M05017-01/1) Avail: NTIS HC A05/MF A01

The energy needs of representative jurisdictions are identified.

A user requirements committee assisted the program in the selection of energy needs and in identifying the most appropriate solution that matches the energy need. One energy technology was selected for immediate implementation (i.e., The Energy Conservation Retrofit Manual for Existing Public Institutional Facilities) and an agenda of other energy technologies was developed for future implementations in urban communities. The discussion of each of the above topics is presented in detail. Results show a significant number of local government officials are eager and willing to participate in energy-conservation programs that can provide direct benefit to local governments in general, and an existing technology delivery system (the Urban Technology System) is successfully being used to implement energy technologies in local governments. DOE

N79-13537# Sandia Labs., Albuquerque, N. Mex. Advanced Energy Products Div.

SOLAR IRRIGATION PROGRAM Status Report, 1 Oct. 1977

Robert L. Alvis Mar. 1978 59 p refs

(Contract EY-76-C-04-0789)

(SAND-78-0049) Avail: NTIS HC A04/MF A01

The construction, dedication, and initial operation of the shallow-well solar irrigation project and the initial operational phase of the deep-well project are documented. Solar irrigation systems analyses are also discussed. DOE

N79-13538# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.

BROOKHAVEN NATIONAL LABORATORY BURNER-BOILER/FURNACE EFFICIENCY TEST PROJECT. ANNUAL FUEL USE AND EFFICIENCY REFERENCE MANUAL: HYDRONIC EQUIPMENT

J. Batey, R. Hoppe, A. L. Berlad, T. Allen, and R. McDonald Dec. 1977 20 p

(Contract EY-76-C-02-0016)

(BNL-50816) Avail: NTIS HC A02/MF A01

A procedure for calculating the annual fuel use and seasonal efficiency of a particular heating unit was developed based upon laboratory measurement of steady state and part-load efficiency. The Annual Fuel Use and Efficiency (AFUE) calculation procedure provides a simple and direct method by which detailed efficiency measurements can be translated to annual fuel use data for ranges of field variables. The direct efficiency measurements performed in the laboratory in conjunction with the AFUE procedure provide a standard quantitative method for comparison of heating units on a common and realistic basis. DOE

N79-13539# Battelle Pacific Northwest Labs., Richland, Wash.

ANALYSIS OF FEDERAL INCENTIVES USED TO STIMULATE ENERGY PRODUCTION

Jun. 1978 400 p refs

(Contract EY-76-C-06-1830)

(PNL-2410) Avail: NTIS HC A17/MF A01

A Federal incentive is any action that can be taken by the government to expand residential and commercial use of solar energy. The text of this report identifies, qualifies, and analyzes such incentives and relates them to current thought about solar energy. Four viewpoints used in this discussion come from four types of analysis: economic, political, organizational and legal. Actions (primarily domestic) that the Federal government has taken are identified. Incentives, investments, liabilities, regulations, and other factors are analyzed in detail for nuclear energy, hydroelectric power, coal, petroleum, and natural gas. Incentives of all energy sources are discussed with respect to solar energy policy. Author (DOE)

N79-13540# Gordian Associates, Inc., New York.

HEAT PUMP TECHNOLOGY: A SURVEY OF TECHNICAL DEVELOPMENTS, MARKET PROSPECTS AND RESEARCH NEEDS

Jun. 1978 562 p refs

(Contract EX-76-C-01-2121)

(HCP/M2121-01) Avail: NTIS HC A24/MF A01

The on-site energy consumption, energy and life cycle cost, market prospects, institutional factors and primary or resource energy efficiency of heat pumps for residential and commercial applications were evaluated. Calculations of the on-site and primary energy effectiveness, and cost of conventional and advanced heat pumps in comparison to electric and combustion furnaces and baseboard heat were made by means of two hour-by-hour computer simulation programs; one for a 2-story frame residential building, one for a 2-story masonry office building. These buildings were hypothetically moved about to nine different locations (cities) selected as representative of the various climatic regions of the continental United States. Electric heat pumps were more efficient than any other all-electric HVAC system. The general conclusion is that no residential or commercial HVAC system is universally to be preferred to any other if energy effectiveness, life-cycle cost, building application and other pertinent factors are considered. DOE

N79-13541# Battelle Pacific Northwest Labs., Richland, Wash.

STORED ENERGY CALCULATION: THE STATE OF THE ART

M. E. Cunningham, D. D. Lanning, A. R. Olsen, R. E. Williford, and C. R. Hann May 1978 145 p refs

(Contract EY-76-C-06-1830)

(PNL-2581) Avail: NTIS HC A07/MF A01

State of the art of fuel temperature, gap conductance, and stored energy calculations was reviewed. Major emphasis was placed on the propagation of input and model uncertainties. A comparison was made of the observed variability of experimental data for fuel centerline temperature and gap conductance values. The uncertainty analysis was performed by identifying major thermal models and collecting them into an abstract of a thermal performance code. Uncertainties in the calculations were determined using the method of propagation of uncertainties with a first order Taylor series approximation to the nonlinear functions. Output uncertainty results were presented for the beginning of fuel life, the end of life, and throughout a typical power history. Also presented was an influence and importance analysis for the input parameters. It was concluded that the relative uncertainty in stored energy is approximately +-20 percent at beginning of fuel life, and increases to +-25 to 40 percent contact. DOE

N79-13542# Honeywell, Inc., Minneapolis, Minn. Energy Resources Center.

SOLAR PILOT PLANT, PHASE 1 Final Report, 1 Jul. 1975 - 1 Jul. 1977

1 Feb. 1978 92 p

(Contract EY-76-C-03-1109)

(SAN-1109-77-7) Avail: NTIS HC A05/MF A01

The preliminary design for a 10-MW(e) solar pilot plant of the central receiver type was developed. The design includes estimates of cost, performance, and cost for a 100-MW(e) plant. Subsystem research experiments were conducted on the collector subsystem and the steam generator portion of the receiver subsystem. A lesser amount of testing was done on a latent-heat storage subsystem before a sensible-heat storage subsystem was incorporated at the direction of ERDA. All test results and analyses point to the feasibility of the pilot plant, and by extension to commercial-scale plants. On this basis and in light of the worsening energy situation, it is recommended that Phase II of the program be undertaken as quickly as practical. DOE

N79-13543# New Zealand Energy Research and Development Committee, Auckland.

ENERGY SCENARIOS: SUPPLEMENTARY STUDIES

G. S. Harris, Murray J. Ellis, Graham C. Scott, Jonathan R. Wood, Peter H. Phillips, and Nigel P. Isaacs Apr. 1978 17 p refs

(NP-23292; Rept-33) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Three paths for New Zealand's energy future were discussed previously in Energy Scenarios for New Zealand. The three scenarios, Continuation, Low New Zealand Pollution, and Limited Growth demonstrated the energy implications of different social attitudes to material wealth, environment, and resources. Additional work was undertaken on four of the most important problems on which it was felt the scenarios provided insufficient information. These studies attempt to answer questions about the impact of particular policy options on energy supplies. They all use the economic structure of the Continuation scenario for determining energy demands. The themes of the three new

studies used on modifying the energy supplies and demands of Continuation are; increased energy efficiency; reduced imports of fossil fuels; and renewable sources. Author (DOE)

N79-13544# Carrier Corp., Syracuse, N. Y. Energy Systems Div.

CANDIDATE CHEMICAL SYSTEMS FOR AIR COOLED, SOLAR POWERED, ABSORPTION AIR CONDITIONER DESIGN. PART 2: SOLID ABSORBENTS, HIGH LATENT HEAT REFRIGERANTS

W. J. Biermann Apr. 1978 81 p refs
(Contract EG-77-C-03-1587)
(SAN-1587-2) Avail: NTIS HC A05/MF A01

Work done in attempting to qualify absorption refrigeration systems based on refrigerants with intermediate latent heats of vaporization is summarized. In practice, these comprise methanol, ammonia, and methylamine. A wide variety of organic substances, salts, and mixtures were evaluated in as systematic a manner as possible. Several systems of interest are described. The system, LiClO3-LiBr-H2O, is a good back up system to our first choice of an antifreeze additive system, and thermodynamically promising but subject to some inconvenient materials limitations. The system, LiBr/ZnBr2-methanol, is thermodynamically promising but requires additional kinetic qualification. Chemical stability of the system, LiCNS-ammonia/methylamine with various other third components, does not appear to be adequate for a long-lived system. DOE

N79-13545# National Technical Information Service, Springfield, Va.

SOLAR SPACE HEATING AND AIR CONDITIONING, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - Aug. 1977

Audrey S. Hundemann Sep. 1978 247 p
(NTIS/PS-78/1014/6) Avail: NTIS HC $28.00/MF $28.00 CSCL 13A

Design, technical feasibility, performance, and economic factors pertaining to solar heating and cooling of buildings are discussed. Commercial buildings, schools, and residential buildings are covered, with emphasis on the assessment of solar heating and cooling systems for residential buildings. A few abstracts are included on solar energy as a national energy resource; solar energy research program alternatives; and social, environmental, and institutional factors affecting the feasibility of using solar energy for heating and cooling buildings. This updated bibliography contains 241 abstracts, one of which are new entries to the previous edition. GRA

N79-13546# National Technical Information Service, Springfield, Va.

SOLAR SPACE HEATING AND AIR CONDITIONING VOLUME 3. CITATIONS FROM THE NTIS DATA BASE Progress Report, Sep. 1977 - Sep. 1978

Audrey S. Hundemann Sep. 1978 96 p Supersedes NTIS/PS-77/0827; NTIS/PS-76/0727; NTIS/PS-75/689; NTIS/PS-75/345
(NTIS/PS-78/1015/3; NTIS/PS-77/0827; NTIS/PS-76/0727; NTIS/PS-75/689; NTIS/PS-75/345) Avail: NTIS HC $28.00/MF $28.00 CSCL 13A

Design, technical feasibility, performance, and economic factors pertaining to solar heating and cooling of buildings are discussed. Commercial buildings, schools, and residential buildings are covered, with emphasis on the assessment of solar heating and cooling systems for residential buildings. A few abstracts on solar energy as a national energy resource; solar energy research program alternatives; and social environmental and institutional factors affecting the feasibility of using solar energy for heating and cooling buildings. This updated bibliography contains 90 abstracts, all of which are new entries to the previous edition. GRA

N79-13547# National Technical Information Service, Springfield, Va.

SOLAR SPACE HEATING AND AIR CONDITIONING, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Sep. 1977 - Sep. 1978

Audrey S. Hundemann Sep. 1978 103 p Supersedes NTIS/PS-77/0829; NTIS/PS-76/0728
(NTIS/PS-78/1017/9; NTIS/PS-77/0829; NTIS/PS-76/0728) Avail: NTIS HC $28.00/MF $28.00 CSCL 13A

The use of solar energy to heat and cool buildings is studied, with emphasis on the heating and cooling of residential buildings and schools. Design, technical feasibility, economics, and performance simulation studies are cited. Abstracts pertaining to solar assisted heat pump systems and assessment of solar heated Rankine cycle cooling are included. This updated bibliography contains 97 abstracts, all of which are new entries to the previous edition. GRA

N79-13548# Cameron Engineers, Inc., Denver, Colo.

EPA PROGRAM STATUS REPORT: OIL SHALE

L. Eckstein Feb. 1978 57 p refs
(Contract EPA-68-01-4337)
(PB-284480/1; EPA-600/7-78-020) Avail: NTIS HC A04/MF A01 CSCL 08I

An overview of oil shale research and development efforts performed by EPA, or funded by EPA monies passed through to other federal agencies under the interagency Energy/Environment R and D Program is presented. Topics included are: the purpose, background, and rationale behind EPA's efforts; EPA program goals and fiscal year 1977 program funding; and the scope-of-work for 55 projects. A table summarizes these projects by presenting project title, sponsoring agency, performing organization, and project duration. GRA

N79-13549# Arizona Univ., Tucson. Office of Arid Lands Studies.

SOLAR ENERGY, WATER, AND INDUSTRIAL SYSTEMS IN ARID LANDS: TECHNOLOGICAL OVERVIEW AND ANNOTATED BIBLIOGRAPHY

Christopher Duffield 1978 165 p refs Sponsored by the Dept. of Interior
(PB-285129/3; ARID-LANDS-RESOURCE-IP-12; W78-10288; OWRT-W-211(6254)(1)) Avail: NTIS HC A08/MF A01 CSCL 10A

A new conceptual framework within which the countless diverse details of the burgeoning solar energy field can be unified and easily comprehended is presented. The bibliography offers a small but typical selection from the solar energy literature. It includes mostly recent items (1975-1977), and a few important older ones. Major focus is on introductory and review publications, and specialized works dealing with arid lands and water. GRA

N79-13550# National Technical Information Service, Springfield, Va.

SOLAR SPACE HEATING AND AIR CONDITIONING, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1976 - Aug. 1977

Audrey S. Hundemann Sep. 1978 221 p
(NTIS/PS-78/1016/1) Avail: NTIS HC $28.00/MF $28.00 CSCL 13A

Studies from worldwide literature on the use of solar energy to heat and cool buildings are discussed, with emphasis on the heating and cooling of residential buildings and schools. Design, technical feasibility, economics, and performance simulation studies are cited. Abstracts pertaining to solar assisted heat pump systems and assessment of solar heated Rankine cycle cooling are included. This bibliography contains 215 abstracts. GRA

N79-13551# National Technical Information Service, Springfield, Va.

FLAT PLATE SOLAR COLLECTOR DESIGN AND PERFORMANCE. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - Jun. 1978

Audrey S. Hundemann Aug. 1978 104 p
(NTIS/PS-78/0840/5) Avail: NTIS HC $28.00/MF $28.00 CSCL 10A

Federally-funded research on the design and thermal efficiency of air- and liquid-type flat plate collectors is discussed. Topic areas cover convection characteristics, methods to reduce heat loss, optical coatings, and corrosion control. Emphasis is on basic research studies. This bibliography contains 97 abstracts. GRA

N79-13552# Reznek (Ben), Silver Spring, Md.

AN ANNOTATED COMPILATION OF THE SOURCES OF INFORMATION RELATED TO THE USAGE OF ELECTRICITY

IN NON-INDUSTRIAL APPLICATIONS Final Report
Ben Reznek Jul. 1978 690 p Sponsored by HUD Prepared for NBS
(PB-285260/6; NBS/GCR-78/130) Avail: NTIS HC A99/MF A01 CSCL 10A

A thorough compilation is presented of the sources of information related to the usage of electricity in non-industrial applications, as available in the open literature and from the U. S. electrical power industry. The scope encompasses all aspects of: electric loadmanagement; end-use; and the various methods of acquisition, analysis, and implementation of electricity usage data. There are over 400 abstracts; 156 from LRC/AEIC reports, and 264 from the open literature. The abstracts cover references containing over 12,000 pages plus about 2,500 references and 6,200 graphs and tables pertinent to electricity usage in nonindustrial applications. In addition to the LRC/AEIC abstracts, this document identifies over 100 sources of directly relevant information. GRA

N79-13553# National Bureau of Standards, Washington, D. C.
MATERIALS FOR FUEL CELLS Annual Report, Jan. 1977 - Dec. 1977
L. H. Bennett, M. I. Cohen, A. L. Dragoo, A. D. Franklin, and A. J. McAllister Jul. 1978 133 p refs
(PB-285360/4; NBSIR-78-1472) Avail: NTIS HC A07/MF A01 CSCL 10B

In most fuel cell applications a major contribution to the overvoltage, and therefore to a reduction in useful voltage and to efficiency, comes from electrode polarization. For use in hot H_3PO_4 no satisfactory substitutes for Pt were found, but Pt is not completely satisfactory. At the anode its sensitivity to CO poisoning forces the use of higher temperatures and catalytic shift conversion in the fuel processing train. This program studies refractory metal-metalloid compounds as potential anode catalysts. GRA

N79-13554# National Technical Information Service, Springfield, Va.
SILICON SOLAR CELLS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, Oct. 1976 - Nov. 1977
Mona F. Smith Oct. 1978 191 p
(NTIS/PS-78/1114/4) Avail: NTIS HC $28.00/MF $28.00 CSCL 10B

Studies from Government-sponsored research reports on silicon crystal growth, fabrication, methods are included. The performance and testing of these cells, as well as encapsulating materials, are covered. GRA

N79-13555# National Technical Information Service, Springfield, Va.
SILICON SOLAR CELLS, VOLUME 3. CITATIONS FROM THE NTIS DATA BASE Progress Report, Dec. 1977 - Oct. 1978
Mona F. Smith Oct. 1978 212 p Supersedes NTIS/PS-77/0956; NTIS/PS-76/0800; NTIS/PS-75/628
(NTIS/PS-78/1115/1; NTIS/PS-77/0956; NTIS/PS-76/0800; NTIS/PS-75/628) Avail: NTIS HC $28.00/MF $28.00 CSCL 10B

Citations of Government-sponsored research reports on silicon solar cell growth and fabrication are presented. Processes covered include chemical vapor deposition, the Czochraiski method, dendritic growth, ribbon growth, epitaxial growth, and silicon sheet fabrication on substrates. Silicon compound synthesis, purification, and reduction are discussed. Casting, cutting, and shaping of silicon solar cells are included. Solar energy conversion efficiency and performance are described. Abstracts on costs and production of these cells are covered. GRA

N79-13556# National Technical Information Service, Springfield, Va.
SILICON SOLAR CELLS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - Oct. 1978
Mona F. Smith Oct. 1978 200 p Supersedes NTIS/PS-77/0958; NTIS/PS-76/0801
(NTIS/PS-78/1116/9; NTIS/PS-77/0958; NTIS/PS-76/0801) Avail: NTIS HC $28.00/MF $28.00 CSCL 10B

Worldwide research on the development of solar energy conversion devices using silicon ribbons, sheets, films, crystals, and wafers is cited. The preparation, purity, crystal defects, and efficiency of these cells are covered. The economics of solar cell development is discussed. The effects of radiation and weathering on performance are included. GRA

N79-13557# National Technical Information Service, Springfield, Va.
SOLAR ELECTRIC POWER GENERATION, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - Sep. 1978
Audrey S. Hundemann Oct. 1978 232 p Supersedes NTIS/PS-77/0898; NTIS/PS-76/0796; NTIS/PS-75/691; NTIS/PS-75/346
(NTIS/PS-78/1108/6; NTIS/PS-77/0898; NTIS/PS-76/0796; NTIS/PS-75/691; NTIS/PS-75/346) HC $28.00/MF $28.00 CSCL 10B

Citations of Federally-funded research are presented pertaining to electric power generation by both direct conversion with solar cells and indirect conversion using solar heat. Topic areas cover equipment design, site surveys, economics, and feasibility studies of solar power satellite systems, photovoltaic systems, solar total energy systems, and central receiver solar thermal power systems. A few abstracts deal with phase change materials and thermal energy storage systems. GRA

N79-13558# National Technical Information Service, Springfield, Va.
SOLAR ELECTRIC POWER GENERATION, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1976 - Sep. 1978
Audrey S. Hundemann Oct. 1978 250 p Supersedes NTIS/PS-77/0900; NTIS/PS-76/0797
(NTIS/PS-78/1109/4; NTIS/PS-77/0900; NTIS/PS-76/0797) Avail: NTIS HC $28.00/MF $28.00 CSCL 10B

A worldwide literature survey cites power generation by direct conversion with solar cells and indirect conversion using solar heat. Topic areas cover solar tower power plants, orbital solar energy technology, photovoltaic power generation, and solar augmentation of hydroelectric power systems. A few abstracts pertain to the future role that solar energy will play in production of electric power and general studies comparing the technical and economic feasibility of various methods of electric power generation. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N79-13559 Drexel Univ., Philadelphia, Pa.
AN EXPERIMENTAL STUDY OF NO SUB X FORMATION IN MONODISPERSE FUEL SPRAY COMBUSTION Ph.D. Thesis
Ahtisham Ahmad Nizami 1979 127 p
Avail: Univ. Microfilms Order No. 7824349

An experimental facility was developed and instrumented for studying monodisperse fuel spray combustion. A vibrating orifice aerosol generator was used to produce exceedingly uniform sized droplets under specific conditions. This monodisperse spray was fed to a combustion tunnel where a flame was aerodynamically stabilized at atmospheric pressure. The monodisperse ranges were isolated and verified for different orifices and the system was checked for flame stability. Exit plane measurements of NO and NOx were made as a function of droplet diameter using an uncooled aerodynamic quench stainless steel probe. The various fuels used were: isopropanol, n-propanol, n-octane, isooctane, n-heptane and methanol. Temperature profiles and supporting emission measurements of hydrocarbons, carbon monoxide, carbon dioxide and oxygen were also made for both spray burning and premixed systems. Dissert. Abstr.

N79-13560*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
THE 1977 SURFACE OZONE STUDY OF EASTERN VIRGINIA

Margaret E. Williams and Chester L. Parsons Nov. 1978 33 p refs
(NASA-TM-80036) Avail: NTIS HC A03/MF A01 CSCL 04A

Data were collected by primarily twelve ground stations positioned throughout the eastern shore - tidewater area of Virginia and North Carolina. From an analysis of the ozone and wind data, certain trends were found such as the existence of a bias in ozone concentrations between stations and a linear correlation between average ozone concentration and latitude. In addition, higher ozone levels were found with surface winds from certain preferred directions at the various sites. The results, however, do not substantiate ozone or ozone precursor transport. G.G.

N79-13561# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
MEASUREMENT AND IDENTIFICATION OF AEROSOLS COLLECTED NEAR BARROW, ALASKA
Motoi Kumai Jul. 1978 11 p refs
(DA Proj. 4A1-61102-AT-24)
(AD-A058606; CRREL-78-20) Avail: NTIS HC A02/MF A01 CSCL 04/1

Measurements of the concentrations of Aitken nuclei in maritime air were made near Barrow, Alaska, in June 1975 with a modified Nolan-Pollack small-particle detector. The concentrations varied from 50 to 300 particles /cc depending upon meteorological conditions. The mean Aitken nuclei count was 100 particles /cc for diameters greater than .002 micrometers. Transmission electron micrographs of aerosols in maritime air near Barrow were taken. The size range was measured to be 0.01 to 2.5 micrometers in diameter with the most frequently observed diameter being 0.04 micrometers. The volume of the maritime air and the collection efficiency of aerosol particles on filmed grids for electron microscopy were measured. The aerosol concentrations were found to be 76 to 101 particles /cc; the mean concentration was calculated to be 87 particles /cc. The aerosol particles in the maritime air were identified by electron microscopy and selected area electron diffraction analysis. About 20% of the aerosol particles were identified, and 80% of the particles were too small for electron diffraction analysis. Sea salt particles constituted 2% of the total, and clay minerals 3%; these particles were considered to be of natural origin. Solid combustion by-products such as coagulated carbon particles and flyash particles constituted 16%. Despite the comparative remoteness of the sampling site, the measurements indicate that many anthropogenic aerosols were found using an electron microscope. Author (GRA)

N79-13562# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
SYNOPTIC-SCALE VARIABILITY IN ATMOSPHERIC SUSPENDED SULFATE CONCENTRATIONS M.S. Thesis - North Carolina State Univ.
Brian Wells Galusha 1978 54 p refs
(AD-A058399; AFIT-CI-78-63) Avail: NTIS HC A04/MF A01 CSCL 13/2

The spatial variation in atmospheric suspended sulfate concentrations are studied for evidence of meteorologically linked sulfate transformation and transportation. Low frequency (every 12-14 days) data from 41 National Air Surveillance Network stations as well as higher frequency (every 2-3 days) data available from two special studies are examined. Variations in high frequency data with wind direction for St. Louis, Missouri, are compared to local and regional sources of precursor pollutants for two one-year periods; January-December 1969 and April 1975-March 1976. Spatial variations in low frequency sulfate concentrations during the spring season (March-May) for the six-year period 1969-1974 are compared with synoptic weather and wind circulation patterns. These comparisons indicate that regional and local sulfate transport can largely account for large-scale sulfate variations. Sulfate transformation due to humidity, temperature and sunlight intensity do not adequately explain observed variations, but may be of secondary importance. The existence of regionally high concentrations of sulfate in the northeastern United States and of a general summertime peak in sulfate values is confirmed. Author (GRA)

N79-13563# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN ANALYSIS OF THE RELATIONSHIP BETWEEN SULFUR DIOXIDE AND WIND SPEED M.S. Thesis - Utah Univ.
Marvin Granville Coleman Mar. 1978 85 p refs
(AD-A058396; AFIT-CI-78-60) Avail: NTIS HC A05/MF A01 CSCL 13/2

A study of turbulent diffusion in the surface boundary layer is conducted to determine the effects of the wind speed on the distribution of sulfur dioxide (SO2) with time. With the use of autocorrelograms and the spectra of wind speed and SO2, similarities between these scalar quantities under varying stability conditions are investigated. Pollution monitoring sites in the Salt Lake Valley vicinity and St. Louis are used. Under stable conditions, the auto-correlograms and the spectra of wind speed and SO2 are similar in many respects. The auto-correlograms show very similar coefficients up to a time lag of 13 hours, and the spectra shows similar peaks near periods of 24, 12 and 8 hours. The wind speed peaks are more prominent, which suggests the spectrum of SO2 is affected by the spectrum of the wind speed for periods equal to or less than 24 hours. Forecasting the SO2 spectrum from the wind speed spectrum is possible for the periods near 24 and 12 hours. The similarity between the wind speed and SO2 auto-correlograms and spectra decreases as stability decreases. In the stable periods, the effect of the large scale motions is suppressed, and more energy is found in the higher frequencies than in neutral or unstable periods. Author (GRA)

N79-13564# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
AN ANALYSIS OF AIRCRAFT FLYOVER NOISE Final Report
David Q. Walker Wright-Patterson AFB, Ohio AMRL Apr. 1978 53 p refs
(Contract F33615-76-C-0528; AF Proj. 7231)
(AD-A058522; BBN-3698; AMRL-TR-78-8) Avail: NTIS HC A04/MF A01 CSCL 20/1

A detailed analysis of a set of Boeing 727 aircraft flyover noise measurements is presented. The flyover data were acquired over a wide range of sideline distances and angles of aircraft elevation with respect to the measurement position. Relationships are derived for excess attenuation due to ground effect and reflection interference as a function of both frequency and angle of aircraft elevation. Angle of elevation is found to be the principal normalizing factor for excess attenuation in the frequency range 50 - 1600 Hz over measurement distances of 800 - 9000 feet. Ground effect, separable from ground reflection interference phenomena in this analysis, was found to be a maximum in the frequency range 125 - 400 Hz and as high as 17 db at an aircraft elevation angle of 4 deg. Spectral distortion due to reflection interference is found to be important at high angles of elevation but diminishes rapidly at aircraft elevation angles of less than 20 deg. Recommendations are presented on the use of the results of this analysis to guide the development of improved flyover noise prediction techniques. GRA

N79-13565# Oklahoma Univ., Norman. Dept. of Chemistry.
ORGANOTINS IN BIOLOGY AND THE ENVIRONMENT
J. J. Zuckerman 1 Jul. 1978 40 p refs Submitted for publication
(Contract N00014-77-C-0432; NR Proj. 053-636)
(AD-A058620; TR-2) Avail: NTIS HC A03/MF A01 CSCL 11/3

Tin chemistry has been the subject of much research effort in the last few years. Elemental tin possesses two allotropic modifications, forms a wide variety of intermetallic phases and inorganic compounds, and has an extensive organometallic chemistry. Basic studies in organotin chemistry are stimulated by the obvious close analogies and interesting differences with the even more extensive chemistry of the cognate organosilicon compounds, and with the vast body of organic chemistry, and also by the success with which a large number of modern physical techniques can be applied to organotin compounds. GRA

N79-13566# Brookhaven National Lab., Upton, N. Y.
BROOKHAVEN AUTOMATIC SEQUENTIAL PRECIPITATION SAMPLER
G. S. Raynor and J. P. McNeil Jan. 1978 30 p refs
(Contract EY-76-C-02-0016)

(BNL-50818) Avail: NTIS HC A03/MF A01

An Automatic Sequential Precipitation Sampler was designed and constructed at Brookhaven National Laboratory to collect precipitation samples for chemical analysis. The sampler is designed to collect both wet and frozen precipitation and to exclude dry fallout between precipitation events. The sampler consists of a large box containing a turntable holding 30 sampling bottles. Sample bottles are changed automatically and periodically. Times of cover opening and closing and of bottle changing are recorded on an event recorder. The sampler has operated successfully since June 1976. DOE

N79-13567# Brookhaven National Lab., Upton, N. Y.
EXPERIMENTAL DATA FROM ANALYSIS OF SEQUENTIAL PRECIPITATION SAMPLES AT BROOKHAVEN NATIONAL LABORATORY
G. S. Raynor and J. V. Hayes Apr. 1978 48 p refs
(Contract EY-76-C-0016)
(BNL-50826) Avail: NTIS HC A03/MF A01

Hourly precipitation samples were collected at Brookhaven National Laboratory from June 1976 through May 1977 using an Automatic Sequential Precipitation Sampler. Conventional meteorological data were recorded for each sample period. The samples were analyzed for pH, conductivity and concentrations of sulfate, nitrate, ammonium, sodium and chloride ions. Statistical analyses were performed of the relationships between selected chemical variables and between then and meteorological conditions. Results are presented in a series of tables. DOE

N79-13568# Brookhaven National Lab., Upton, N. Y.
THE 1977 ENVIRONMENTAL MONITORING REPORT
J. R. Naidu, ed. Apr. 1978 82 p refs
(Contract EY-76-C-02-0016)
(BNL-50813) Avail: NTIS HC A05/MF A01

The environmental levels of radioactivity and other pollutants found in the vicinity of Brookhaven National Laboratory are summarized. As an aid in the interpretation of the data, the amounts of radioactivity and other pollutants released in airborne and liquid effluents from laboratory facilities to the environment are also indicated. The environmental data includes external radiation levels; radioactive air particulates; tritium and iodine concentrations; the amounts and concentrations of radioactivity in and the quality of the stream into which liquid effluents are released; the concentrations of radioactivity in sediments and biota from the stream; the concentrations of radioactivity in and the quality of ground waters underlying the laboratory; and concentrations of radioactivity in milk samples obtained in the vicinity of the laboratory. DOE

N79-13569# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
NOISE-CONTROL NEEDS IN THE DEVELOPING ENERGY TECHNOLOGIES
D. N. Keast Mar. 1978 250 p refs
(Contract EE-77-C-02-4389)
(COO-4389-1) Avail: NTIS HC A11/MF A01

The noise characteristics of existing energy conversion technologies, e.g., from obtaining and processing fossil fuels to power plants operations, and of developing energy technologies (wind, geothermal sources, solar energy or fusion systems) are discussed in terms of the effects of noise on humans, animals, structures, and equipment and methods for noise control. Regulations for noise control are described. Recommendations are made for further research on noise control and noise effects. DOE

N79-13570# Argonne National Lab., Ill.
DUST REMOVAL FROM HOT AND COMPRESSED GAS STREAMS BY FIBROUS- AND GRANULAR-BED FILTERS: A STATE OF THE ART REVIEW
S. C. Saxena and W. M. Swift May 1978 76 p refs
(Contract W-31-109-eng-38)
(ANL/CEN/FE-77-9) Avail: NTIS HC A05/MF A01

The literature available on the use of fixed-bed and fluidized-bed filters is reviewed to assess our present ability to design efficient and reliable filtration units for hot, compressed gases. The basic mechanisms for solids collection from gas streams are: gravity setting, direct interception, inertial impaction, Brownian diffusion, and thermal separation. The guiding principles of these mechanisms and the characteristic parameters which control the collection of particles are summarized. Calculation procedures are enumerated for estimating total or overall collection efficiency of a single filter unit (cylinder or sphere) and that of a filter consisting of an assembly of individual filter units. DOE

N79-13571# Argonne National Lab., Ill.
ENVIRONMENTAL CONTROL IMPLICATIONS OF GENERATING ELECTRIC POWER FROM COAL APPENDIX A, PART 2: COAL PREPARATION AND CLEANING ASSESSMENT STUDY APPENDIX Technology Status Report, 1977
Dec. 1977 392 p refs Prepared in cooperation with Bechtel Corp., San Francisco
(Contract W-31-109-eng-38)
(ANL/ECT-3-App-A-Pt-2) Avail: NTIS HC A17/MF A01

The results of integrating coal washability and coal reserves data obtained from the U.S. Bureau of Mines are presented. Two computer programs were developed to match the appropriate entries in each data set and then merge the data. Approximately 18% of the total demonstrated coal reserves were matched with washability data. However, about 35% of the reserves that account for 80% of current production were successfully matched. Each computer printout specifies the location and size of the reserve, and then describes the coal with data on selected physical and chemical characteristics. Washability data are presented for three crush sizes and several specific gravities. In each case, the percent recovery, Btu/lb, percent ash, percent sulfur, and reserves available are given. The sources of the original data and the methods used in the integration are discussed briefly. DOE

N79-13572# Brookhaven National Lab., Upton, N. Y. National Center for Analysis of Energy Systems.
ASSESSMENT OF THE SOLID WASTE IMPACT OF THE NATIONAL ENERGY PLAN
P. Meier, E. Rubin, T. Le, R. Stern, E. Kaplan, F. Barvenik, and K. Blumer Feb. 1978 65 p refs
(Contract EY-76-C-02-0016)
(BNL-50708) Avail: NTIS HC A04/MF A01

The only significant effect of the National Energy Plan (NEP) on solid waste management in electric utilities will be to shift the regional distribution of impacts. Nationally, NEP may result in an increase of ash by 1 percent, and a decrease in the scrubber sludge disposal area requirement by up to 10 percent. A significant fraction of coal using industries will use FGD systems that produce liquid effluents rather than sludge residuals, with discharge to municipal sewage systems or to water bodies. This will increase dissolved solids concentrations in the receiving waters, but at concentrations that are not expected to be of environmental concern except in the arid regions of the west. Because of the significant cost of sludge transportation, industries that have inadequate land for onsite disposal may incur significant cost penalities for sludge disposal, in addition to facing opposition at the local level to the use of regional or municipal disposal facilities. The key environmental uncertainty is the fate of trace and heavy metals at industrial facilities using liquid scrubbing systems and subsequent liquid waste treatment processes. DOE

N79-13573# Department of Energy, Washington, D. C.
REQUIREMENTS FOR ENVIRONMENTAL MONITORING ASSESSMENT, AND CONTROLS FOR NONNUCLEAR ENERGY DEMONSTRATION PROJECTS. REPORT TO CONGRESS, PREPARED IN FULFILLMENT OF PUBLIC LAW 95-39, SECTION 113
May 1978 41 p refs
(DOE/EV-0014) Avail: NTIS HC A03/MF A01

Two demonstration projects pursued by DOE and authorized by Congress are reviewed. Both projects are demonstrations of coal gasification technologies. The environmental effects which are pertinent to the general area of coal gasification are delineated and a comprehensive overview is given of the potential environmental concerns. DOE

N79-13574# Department of Energy, Washington, D. C.
COAL LOAN GUARANTEE PROGRAM (PL 94-163) Final Environmental Impact Statement
Jul. 1978 482 p refs
(DOE/EIS-0004) Avail: NTIS HC A21/MF A01

The potential environmental impacts of the program are

considered in the following sequence: (1) identify the geographic areas where coal production and coal use will be most directly affected by the program, (2) quantify the extent to which coal production and use will be affected in these areas, (3) quantify, for a typical mine, steam coal preparation plant and coal combustion facility, the extent to which environmental residuals (i.e., pollutants) will be affected, (4) aggregate the environmental residuals produced by such facilities for the geographic regions identified to assess the regional environmental impacts of implementing the program, and (5) consider alternatives to the program. DOE

N79-13575# Harvard School of Public Health, Boston, Mass.
PERFORMANCE OF A HIGH VELOCITY PULSE-JET FILTER
David Leith, Melvin W. First, and Dwight D. Gibson Jul. 1978 70 p refs
(Grant EPA-R-801399)
(PB-284332/4; EPA-600/7-78-131) Avail: NTIS HC A04/MF A01 CSCL 13J

An economic analysis of pulse-jet filtration is presented. If the device is operated continuously, the filtration velocity associated with least total annualized cost is about 3 cm/s (6 ft/m). As annual operating time decreases, operating costs decrease; however, fixed cost remains about the same. Although the analyses depend on the particular values for cost factors used in the economic model, the least cost trend of increased velocity with decreased operating time should stand, regardless of the values used. As filtration velocity increases, penetration also increases. Experiments determined that essentially all penetration through the filter is due to seepage, and that almost no particles penetrate straight through without stopping. GRA

N79-13576# Southern Research Inst., Birmingham, Ala.
A MATHEMATICAL MODEL OF ELECTROSTATIC PRECIPITATION, REVISION 1. VOLUME 1: MODELING AND PROGRAMMING
Jack R. McDonald Jun. 1978 232 p refs Revised
(Contract EPA-68-02-2114)
(PB-284614/5; SORI-EAS-78-101-Vol-1-Rev-1; EPA-600/7-78-111A-Vol-2-Rev-1; Rept-3460-6-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 07A

The fundamental mechanisms and limiting factors involved in the electrostatic precipitation process are described. The theories and procedures used in the computer model to describe the physical mechanisms, and generally describes the major operations performed in the computer program is listed and all variables used in the program is listed. Major improvements to the fundamental basis of the model include: the capability of generating theoretical voltage-current characteristics for wire-plate geometries: a new method for describing the effects of rapping reentrainment: and a new procedure for predicting the effects of particles on the electrical conditions. The computer is made more user oriented by making the input data less cumbersome, by making the output data more complete, by making modifications which save computer time, and by providing for the construction of log-normal particle size distributions. GRA

N79-13577# Southern Research Inst., Birmingham, Ala.
A MATHEMATICAL MODEL OF ELECTROSTATIC PRECIPITATION, REVISION 1. VOLUME 2: USER MANUAL Report, Jun. 1975 - Feb. 1978
Jack R. McDonald Jun. 1978 647 p refs Revised
(Contract EPA-68-02-2114)
(PB-284615/2; SORI-EAS-78-101-Vol-2-Rev-1; EPA-600/7-78-111B-Vol-2-Rev-1; Rept-35406-Vol-2-Rev-1) Avail: NTIS HC A99/MF A01 CSCL 07A

A comprehensive description is given of how to use the computer program which performs the calculations in the mathematical model of electrostatic precipitation, and instructs in the proper usage of the model. Input and output data associated with the computer program is described,and the data in various forms covering the different uses of the model are presented. The predictions of the model with experimental data are compared, and the agreement obtained is discussed. The various applications of the model are described and demonstrated in detail. The applications of the model for troubleshooting and sizing of precipitators are reviewed, emphasizing throughout the precautions to be taken in using the model. GRA

N79-13578# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
STATE IMPLEMENTATION PLAN EMISSION REGULATIONS FOR NITROGEN OXIDES: FUEL COMBUSTION
J. D. Crenshaw and C. H. Kuo Jun. 1978 81 p
(PB-284190/6; EPA-450/2-78-023) Avail: NTIS HC A05/MF A01 CSCL 13B

A summary of each state's implementation plan (SIP) regulations for nitrogen oxides is presented. The relationship between the SIP regulations, the National Ambient Air Quality Standards, and the Federal Standards of Performance for New Stationary Sources is explained. The various types of emission regulations which appear in the SIP are discussed. GRA

N79-13579# National Technical Information Service, Springfield, Va.
AIR POLLUTION EFFECTS ON MATERIALS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Aug. 1978
William E. Reed Oct. 1978 129 p Supersedes NTIS/PS-77/0912; NTIS/PS-76/0854; NTIS/PS-75/760; NTIS/PS-74/113 (NTIS/PS-78/1073/2; NTIS/PS-77/0912; NTIS/PS-76/0854; NTIS/PS-75/760; NTIS/PS-74/113) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

A bibliography containing 124 abstracts concerning research reports on corrosion and damage by air pollution. Studies on the effects upon steel, textiles, and buildup materials is presented. Specific pollutants and corrosive or damaging properties were examined. GRA

N79-13580# National Technical Information Service, Springfield, Va.
AIR POLLUTION EFFECTS ON MATERIALS. CITATIONS FROM THE AMERICAN PETROLEUM INSTITUTE DATA BASE Progress Report, 1971 - Apr. 1978
William E. Reed Oct. 1978 73 p
(NTIS/PS-78/1074/0) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

A bibliography containing 69 abstracts concerning corrosion and damage by air pollution and includes studies on the effects upon steel, textiles, and building materials is presented. Specific pollutants and its corrosive damaging properties were examined. GRA

N79-13581# Environmental Protection Agency, Washington, D. C. Municipal Construction Div.
ENVIRONMENTAL CHANGES FROM LONG-TERM LAND APPLICATIONS OF MUNICIPAL EFFLUENTS
T. D. Hinesly, R. L. Thomas, and R. G. Stevens Mar. 1978 39 p refs
(PB-284857/0; EPA-430/9-78-003; EPA-MCD-26) Avail: NTIS HC A03/MF A01 CSCL 02C

Soil and plant samples were collected at Bakersfield, California, and Lubbock, Texas from fields where sewage was used for crop irrigation. The fields at Bakersfield were irrigated with raw sewage for about 10 years followed by irrigation with primary effluent for at least 35 years. The fields at Lubbock were irrigated for 6, 19, or 38 years with treatment plant effluent. The results show that crop production is increasing by the use of municipal effluents as opposed to use of fresh water and commercial fertilizers. There was no indication that crop quality or soil physical properties were adversely affected by the long-term effluent irrigation practice. GRA

N79-13582# IIT Research Inst., Chicago, Ill.
EVALUATING AND OPTIMIZING ELECTRON MICROSCOPE METHODS FOR CHARACTERIZING AIRBORNE ASBESTOS Final Report, Jun. 1975 - Jun. 1977
A. V. Samudra, F. C. Bock, C. F. Harwood, and J. D. Stockham Jun. 1978 198 p refs
(Contract EPA-68-02-2251)
(PB-284828/1; EPA-600/2-78-038) Avail: NTIS HC A09/MF A01 CSCL 14B

A large number of variables and subprocedures were studied

in a five-phase program using elaborate statistically designed experiments. Observations were analyzed by advanced regression techniques to evaluate the effects of independent variables and subprocedures. It was shown that the optimized method for estimating airborne chrysolite should have the following features: (1) collecting an air sample on Nuclepore filter; (2) coating the Nuclepore filter with carbon; (3) transferring the particulate deposit to a 200-mesh electron microscope grid using chloroform in a modified Jaffe-wick washer; (4) examining the grid at about 10,000 x magnification (20,000 x for counting very fine fibers); (5) counting fibers using a field of view method; and (6) identifying the type of asbestos from morphology and selected area electron diffraction. GRA

N79-13583# Ohio State Univ., Columbus. Research Foundation.
APPLICATION OF FOURIER TRANSFORM SPECTROSCOPY TO AIR POLLUTION PROBLEMS Interim Report
Yoon S. Chang Jun. 1978 121 p refs
(Grant EPA-R-803868)
(PB-285077/4; EPA-600/3-78-057) Avail: NTIS HC A06/MF A01 CSCL 04A

An atlas of observed and calculated air spectra from 700 to 2300/cm was prepared. Methods of analyzing air spectra to identify spectral features and to determine simultaneously the abundances of atmospheric gases such as CO, N2O, CH4, O3, H2O, and CO2 are explored. These methods include ratioing observed and calculated spectra and correlation analysis of absorption bands to obtain abundances by linear regression and nonlinear least squares methods. Absorbing features of atmospheric gases such as O3, H2O, and N2O was removed from solar spectra to isolate underlying features of F-12 near 1160/cm. Simulations of the reactions in a typical NOX-RH-RCHO-polluted atmosphere exposed to sunlight show that the theoretical rate of HO2NO2 generation is similar in magnitude to those expected (and observed in real atmospheres) for peroxyacylnitrates. GRA

N79-13584# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Criteria and Assessment Office.
ALTITUDE AS A FACTOR IN AIR POLLUTION Final Report
Jun. 1978 41 p
(PB-285645/8; EPA-600/9-78-015) Avail: NTIS HC A03/MF A01 CSCL 13B

Cities with surface elevations above 1500 meters have atmospheric pressure which are approximately fifteen percent below pressures at sea level. Mobile sources designed to operate at pressures of one atmosphere perform less efficiently at high altitudes and emit greater amounts of hydrocarbons and carbon monoxide than those designed to operate at the lower atmospheric pressures. The net result is a photochemical smog problem which is further enhanced by the increased solar radiation of higher altitudes. The most significant effect of air pollution at high altitudes is upon human health. This is due primarily to the inhalation of carbon monoxide at the reduced oxygen concentrations of high altitudes. Particularly susceptible is the fetus exposed to hypoxia and elevated carboxyhemoglobin levels. Reduction in visibility is being observed in the vicinity of large metropolitan areas and near large industrial complexes at high altitudes. GRA

N79-13585# Southern Research Inst., Birmingham, Ala.
CEA VARIABLE-THROAT VENTURI SCRUBBER EVALUATION Final Report, May - Dec. 1977
Joseph D. McCain Jun. 1978 81 p
(Contract EPA-68-02-1480)
(PB-285723/3; SORI-EAS-78-348; EPA-600/7-78-094) Avail: NTIS HC A05/MF A01 CSCL 13B

Detailed results of fractional and overall mass efficiency tests of a variable-throat venturi scrubber is reported. The tests were performed on a full scale scrubber used for controlling particles and SOx emissions from a pulverized coal fired utility boiler. Total flue gas particulate mass concentrations were determined at the scrubber inlet and outlet by conventional techniques. Inlet and outlet particulate concentrations as functions of size were determined on a mass basis using cascade impactors and sizes from about 0.3 to 5 micrometers, and on a number basis for sizes smaller than about 1 micrometer using optical and electrical mobility techniques. GRA

N79-13586# Industrial Environmental Research Lab., Research Triangle Park, N. C.
EPA FABRIC FILTRATION STUDIES: 6. INFLUENCE OF DUST PROPERTIES ON PARTICLE PENETRATION Final Task Report, Apr. 1974 - Dec. 1977
R. P. Donovan, B. E. Daniel, and J. H. Turner Jul. 1978 47 p refs
(PB-284987/5; EPA-600/7-78-141) Avail: NTIS HC A03/MF A01 CSCL 13K

The importance of dust properties in determining dust penetration through a fabric filter was examined. The major property considered was the size distribution of the dust, which is an important dust property for dust penetration. Most other important variables of dust penetration depend more on the dust/fabric combination than on the dust alone. Dust penetration mechanisms are reported and related to dust and dust/fabric properties. Shaker and pulse jet baghouse data used in an attempt to identify commonality in dust penetration independent of fabric cleaning technique. GRA

N79-13587# GCA Corp., Bedford, Mass.
PARTICULATE CONTROL HIGHLIGHTS: RESEARCH ON FABRIC FILTRATION TECHNOLOGY Special Report, Nov. 1977 - May 1978
R. Dennis and N. F. Surprenant Jun. 1978 20 p refs
(Contract EPA-68-02-2177)
(PB-285393/5; EPA-600/8-78-005D) Avail: NTIS HC A02/MF A01 CSCL 13L

Several field and laboratory studies performed by or under the sponsorship of the EPA are reviewed. A background of fabric filter design and operational concepts is followed by a sampling of actual field performance with various coal fly ash aerosols and a description of an operational mobile pilot filter system that is used to facilitate the selection of operating parameters, fabric type, and method of fabric cleaning. Fabric weave and constituents are discussed with respect to their bearing on working temperatures, method of cleaning, fabric life, pressure loss, and dust retention. Attention is also called to the impact of pinhole or pore leakage on collection efficiency and effluent size properties. The pros and cons of increasing air-to-cloth ratio to reduce fabric and other capital costs are compared with attendant disadvantages of increased power needs and higher emission rates. Pilot and bench scale tests show that effluent concentrations increase very rapidly with face velocity. Modeling concepts that provide realistic predictions of glass fiber performance with coal fly ash are reviewed. GRA

N79-13588# Environmental Monitoring and Support Lab., Research Triangle Park, N. C.
AIR QUALITY DATA FOR NONMETALLIC INORGANIC IONS: NH4(+), NO3(-), SO4(=) FROM THE NATIONAL AIR SURVEILLANCE NETWORKS, 1975 Final Report
Donald H. Fair, Raymond C. Rhodes, E. Gardner Evans, John C. Puzak, and Frank E. Butler Jun. 1978 67 p refs
(PB-285087/5; EPA-600/4-78-035) Avail: NTIS HC A04/MF A01 CSCL 13B

A list is given of the urban and nonurban concentrations of 3 nonmetal inorganic constituents of suspended particulate matter from samples gathered during calendar year 1975 by the cooperating stations of the National Air Surveillance Network (NASN). The individual 24-hour data are summarized as cumulative frequency distributions for each site. GRA

N79-13589# Research Triangle Inst., Research Triangle Park, N. C.
SURVEY OF PROJECTS CONCERNING CONVENTIONAL COMBUSTION ENVIRONMENTAL ASSESSMENTS Final Report, Mar. 1977 - May 1978
W. E. Thompson and J. W. Harrison Jul. 1978 206 p refs
(Contract EPA-68-02-2612)
(PB-285188/9; EPA-600/7-78-139) Avail: NTIS HC A10/MF A01 CSCL 13B

Information is summarized on activities relating to the environmental assessment of stationary conventional combustion processes. The information was gathered on a nationwide basis

and includes activities sponsored by government, industry, universities, and trade associations. Many abstracts of such work are given in the report. The information obtained was analyzed to determine its significance relative to a planning, coordination, and implementation plan being developed for EPA. GRA

N79-13590# Bureau of Mines, College Park, Md. Metallurgy Research Center.
ANTIMONY, ARSENIC, AND MERCURY IN THE COMBUSTIBLE FRACTION OF MUNICIPAL SOLID WASTE
Benjamin W. Hayes, James C. McConnell, and Stephen L. Law 1978 18 p refs
(PB-285196/2; BUMINES-RI-8293) Avail: NTIS HC A02/MF A01 CSCL 13B

As part of the total metallurgical system to recover metals, glass, and a combustible fraction from urban refuse, the Bureau of Mines conducted analytical studies to determine the concentration of antimony, arsenic, and mercury in the combustible fractions collected at various locations in the Bureau's urban refuse recycling pilot plant. The samples processed through the plant were submitted by various municipalities that are considering resource recovery as an alternative to landfill or other means of disposal. To provide the analytical data, sensitive reproducible chemical digestion-atomic absorption methods were evaluated. GRA

N79-13591# Pacific Northwest Environmental Research Lab., Corvallis, Ore.
ENVIRONMENTAL EFFECTS OF INCREASED COAL UTILIZATION ECOLOGICAL EFFECTS OF GASEOUS EMISSION FROM COAL COMBUSTION Final Report
Norman R. Glass Jun. 1978 62 p refs
(PB-285440/4; EPA-600/7-78-108) Avail: NTIS HC A04/MF A01 CSCL 06F

The economic implications of ecological effects are identified and the reliability of the data base upon which conclusions or estimates are made is evaluated. Aquatic and terrestrial effects are distinguished where the pollutants in question are clearly problems in both media. Sulfur oxide (SOx) emissions and nitrogen oxide (NOx) emissions are projected to be higher in 1985 and 2000 than in 1975. Since SOx and NOx are major contributors to acid precipitation, substantial increases in total acid deposition can be expected in the nation as a whole. At present, acid precipitation is most abundant in the North Central and Northeastern States. GRA

N79-13592# Mitre Corp., McLean, Va. METREK Div.
AN ASSESSMENT OF MERCURY EMISSIONS FROM FOSSIL FUELED POWER PLANTS Final Report
Gerald R. Goldgraben, Kit Krickenberger, Paul Clifford, Norman Zimmerman, and Dennis Martin Jul. 1978 106 p refs
(Contract EPA-68-01-3539)
(PB-285227/5; EPA-600/7-78-146) Avail: NTIS HC A06/MF A01 CSCL 06F

The study has found no evidence of a health or environmental problem as a result of emissions of mercury from power plants. This conclusion has led to the recommendation that a specific control program to address mercury emissions from power plants is not necessary at this time. It is estimated that power plants contributed less than 8 percent of the more than 2000 tons of mercury lost to the environment by all man-made sources in 1974. Studies and scenarios indicate little or no effect of mercury from power plant emissions on ambient air or water concentrations. Health effects, standards and regulations, transport, and transformations of mercury are discussed. GRA

N79-13593# Hitchcock Associates, Farmington, Conn.
BIOGENIC SULFUR COMPOUNDS IN COASTAL ATMOSPHERES OF NORTH CAROLINA Final Report, Aug. 1976 - Feb. 1977
Dian R. Hitchcock, Lester L. Spilter, and William E. Wilson Jul. 1978 74 p refs
(PB-285059/2; EPA-600/3-78-061) Avail: NTIS HC A04/MF A01 CSCL 13B

Atmospheric H2S, SO2, and particulate SO4(2), Na(+), C1(-), NH4(-), and NO3(-) were measured in two experiments on the North Carolina coast to determine the levels of biogenic sulfur species at marsh and estuarine locations where dissimilatory bacterial sulfate reduction produces H2S in local anoxic muds. The first experiment demonstrated the occurrence of variable and high H2S levels--4-h means up to 80 microgram/cu m (57 ppb)--associated with low-tide mud exposure in a Spartine alterniflora marsh. Biogenic sulfate in marine air masses ranged from 2 to 13 microgram/cu m, and was strongly associated with the loss of chloride from marine aerosols. Both H2S and SO2 were observed in the second experiment at concentrations up to 7 microgram/cu m (5 ppb) (H2S) and 25 microgram/cu m (17 ppb)(SO2) at an estuarine site where anoxic muds are not exposed to low tide, under conditions which implied a biogenic origin, and the rapid conversion of biogenic H2S to SO2. GRA

N79-13594# Rutgers Univ., New Brunswick, N. J.
A STUDY OF VEGETATION PROBLEMS ASSOCIATED WITH REFUSE LANDFILLS Research Report, May 1975 - May 1977
Franklin R. Flower, Ida A. Leone, Edward F. Gilman, and John J. Arthur May 1978 142 p refs
(Grant EPA-R-803762)
(PB-285228/3; EPA-600/2-78-094) Avail: NTIS HC A07/MF A01 CSCL 13B

A mail survey of about 1,000 individuals, was conducted for the purpose of determining the status of landfill vegetation growth. Of the 500 people that responded, about 75 percent reported no problems. Twenty-five percent reported problems on landfills and 7 percent reported problems with vegetation adjacent to landfills. Site visits were selected to represent the nine major climatic regions as defined by Trewartha. About 60 individual landfills were visited, and comparisons of the quality of soil atmospheres were made in the root zones of healthy specimens and individuals of the same species that were dead or dying. Comparisons of soil quality were made likewise. Landfill vegetation growth conditions were generally similar for most of the climatic regions visited. GRA

N79-13595# Environmental Quality Research, Inc., Clayton, Mo.
ANALYSIS OF METEOROLOGICAL CONDITIONS DURING THE 1977 ANCLOTE KEYS PLUME STUDY Final Report, Feb. - Nov. 1977
L. Hull, W. Dannevik, and R. Woodford Jul. 1978 70 p
(Contract EPA-68-02-2500)
(PB-284905/7; EPA-600/7-78-117) Avail: NTIS HC A04/MF A01 CSCL 13B

Meteorological conditions are described and analyzed for nine experimental observation periods of the Anclote Keys Plume Study, which was conducted near Tampa, Florida during February 1977. The short and long range transport of power plant plumes and the formation rate of sulfate in a marine environment are covered. The forecasting center, radiosonde, pilot balloon, and tethersonde systems are also described, and the data acquisition schedules are included. GRA

N79-13596# Pacific Environmental Services, Inc., Santa Monica, Calif.
THE USE AND FATE OF LUBRICANTS, OILS, GREASES, AND HYDRAULIC FLUIDS IN THE IRON AND STEEL INDUSTRY Final Task Report, May 1976 - Apr. 1978
J. C. Serne and K. Wilson May 1978 344 p refs
(Contract EPA-68-02-1405)
(PB-284973/5; EPA-600/2-78-101) Avail: NTIS HC A15/MF A01 CSCL 13B

Data from nine integrated steel plants and two consultants with extensive steel industry experience were used to: develop correlations between lubricant usage rates and steel production capacity, and the types of products made; and prepare total oil, grease, and hydraulic fluid materials balances for specific, as well as typical integrated steel plants. Generalizations were made regarding the fate (as air, water, and solid waste pollution) of these oils, greases, and hydraulic fluids. Air pollution emissions, total oil-and-grease water pollution discharges, and the quantity of oil and grease being disposed of in landfills were estimated by steelmaking area and for a typical integrated steel plant. Results indicate that for a typical integrated steel plant with a raw steel production capacity of 4 million ton/yr, 1.2 million lb/mo of oils, greases, and hydraulic fluids are used throughout the plant. Of all lubricants used, an estimated 10% enters the environment as air pollution, 9% as water pollution, and 44% as solid waste. GRA

N79-13597# Mitre Corp., McLean, Va. METREK Div.
A PROGRAM FOR THE ENVIRONMENTAL ASSESSMENT OF CONVENTIONAL COMBUSTION PROCESSES Final Report, Mar. 1977 - Mar. 1978
Deepak C. Kenkeremath, C. Grant Miller, and J. Bruce Truett Jul. 1978 106 p refs
(Contracts EPA-68-01-3539)
(PB-284974/3; M78-63) Avail: NTIS HC A06/MF A01 CSCL 13B

The Conventional Combustion Environmental Assessment Program was established to coordinate and integrate EPA's several research and development efforts for assessing the environmental effects of pollutants from conventional combustion of fossil fuels. Overall program goals and objectives are defined, and existing research and development project involving EA of combustion pollutants are identified. A procedure for analyzing the content of such projects is described and its use demonstrated for a selected subset of current projects to identify duplication of effort or gaps in coverage of areas required for attainment of defined objectives. A set of recommended actions and milestones, based on the analysis of current projects and defined program goals, is presented. GRA

N79-13598# National Technical Information Service, Springfield, Va.
BIOINDICATORS OF POLLUTION, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Nov. 1977
Elizabeth A. Harrison Oct. 1978 248 p
(NTIS/PS-78/1142/5) Copyright. Avail: NTIS HC $28.00/MF $28.00 CSCL 06F

Abstracts are presented for 243 documents relating to the use of biological organisms in the detection of air and water pollution. Topics cover biodeterioration, biochemical oxygen demand, detritogenation, paleontology, bioassay, biostatistics, toxicity, and ecology. Organisms discussed include algae, bacteria, aquatic plants, fungi, insects, amphibians, beaver, bacteria, annelida, oysters, clams, and snails. No entry in this bibliography is new to the previous edition. GRA

N79-13599# National Technical Information Service, Springfield, Va.
BIOINDICATORS OF POLLUTION, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1977 - Oct. 1978
Elizabeth A. Harrison Oct. 1978 49 p Supersedes NTIS/PS-77/0993; NTIS/PS-76/0868; NTIS/PS-75/796; NTIS/PS-75/024 (NTIS/PS-78/1143/3; NTIS/PS-77/0993; NTIS/PS-76/0868; NTIS/PS-75/796; NTIS/PS-75/024) Copyright. Avail: NTIS HC $28.00/MF $28.00 CSCL 06F

The use of microorganisms, animals, plants, and fishes to detect air and water pollution is discussed. Particular organisms covered are algae, bacteria, aquatic plants, oysters, snails, clams, insects, annelida, amphibians, beaver and fungi. This updated bibliography contains 43 abstracts, all of which are new entries to the previous edition. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N79-13600 Washington Univ., Seattle.
THE FREQUENCY SPECTRUM OF GRAVITATIONAL BREMSSTRAHLUNG Ph.D. Thesis
John Walter Douglas Anderson 1978 123 p
Avail: Univ. Microfilms Order No. 7824433

The frequency spectrum of the gravitational radiation produced when two masses gravitationally scatter through a small angle was calculated. This was done by Fourier transforming the wave amplitudes which were calculated as functions of time. The results are valid for velocities from the nonrelativistic to ultrarelativistic regimes, and for all directions and frequencies. Numerical results are presented for general directions and frequencies and exact results are given for the zero frequency and forward and backward direction limits. Some symmetries of the frequency distribution are discussed. The results are compared with thos obtained by other authors who have used approximations which were not employed in this calculation. Dissert. Abstr.

N79-13601* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OGO PROGRAM SUMMARY, SUPPLEMENT 1
John E. Jackson Jun. 1978 119 p
(NASA-SP-7601-Suppl-1) Avail: NTIS HC A06 CSCL 04A

Scientific results from OGO-5 and OGO-6 experiments are summarized and approximately 200 citations are included to update the 1975 OGO bibliography. Personal author, subject, and corporate source indexes are included. The supplement follows the same format as that of the OGO Program Summary; it does not repeat the finalized information in the original publication, which should be consulted for indexes of experiments, experimenters, institutions, and the glossary of abbreviations and acronyms. A.R.H.

N79-13602 Texas Univ. at Dallas.
A STUDY OF PLASMA FLOW IN THE MID-LATITUDE IONIZATION TROUGH Ph.D. Thesis
Robert Walter Spiro 1978 169 p
Avail: Univ. Microfilms Order No. 7824330

Ion drift velocity measurements obtained by instruments on the satellite Atmosphere Explorer-C were analyzed to determine the magnitude and direction of plasma flow in the vicinity of the trough. These observations reveal that ionization troughs are observed on approximately 70% of the crossings of the nighttime mid-latitude ionosphere, although troughs are occasionally observed even when the ionosphere is sunlit. Data from the ion drift meter show that in the pre-midnight local time sector the zonal component of ion drift within the trough is typically westward. In the post-midnight sector the ionization within the trough usually either corotates with the earth or drifts slowly to the east. Latitudinally narrow regions of rapid westward plasma drift (ion drift velocity 'spikes') are often observed in the pre-midnight sector during magnetically active periods. These findings are interpreted in terms of a nighttime plasma-flow model that has the trough form near midnight in a region of slow plasma drift. Dissert. Abstr.

N79-13603 Boston Coll., Chestnut Hill, Mass.
IONOSPHERIC ELECTRIC FIELDS AND CURRENTS OF MAGNETOSPHERIC ORIGIN Ph.D. Thesis
Richard William Nopper, Jr. 1978 202 p
Avail: Univ. Microfilms Order No. 7824563

A model to calculate accurate global distributions of ionospheric electric field and current, given models of the source currents and of the ionospheric electrical conductivity, was developed. For source currents, the systematic large-scale magnetic-field-aligned currents detected observed by polar orbiting satellites were used. These currents, which total millions of amperes, impinge in the high-latitude ionosphere and serve to couple magnetospheric and ionospheric dynamics. To model the ionospheric conductivity tensor, functional forms with simple but realistic spatial dependences, adjusted to conform to measurements were used. Results show that magnetospheric sources alone can contribute strongly tc quiet-time ionospheric morphology, but at middle and more equatorial latitudes, additional sources, probably neutral winds, must be included to gain agreement with observations. Dissert. Abstr.

N79-13604 Iowa Univ., Iowa City.
THE EARTHS MAGNETIC FIELD AT LARGE RADIAL DISTANCES AS OBSERVED BY HAWKEYE 1 Ph.D. Thesis
Tsan-Fu Chen 1978 191 p
Avail: Univ. Microfilms Order No. 7822390

A model of the distant geomagnetic field is derived from the observation and described in both geocentric solar magnetospheric and geocentric magnetic equatorial coordinates. In the latter coordinate system the magnetic topology of the polar cusp is displayed in a more satisfactory manner. A solenoidal system of electrical currents encircling the polar cusp is determined as is the current system on the bow shock. Typical magnitudes of

the surface current density at the equatorward boundary of the cusp are 40 milliamperes/meter. This circulating current, counterclockwise as viewed from the sun, is attributed to the diamagnetic effect of plasma, intruding from the magnetosheath into the cusp. On the bow shock, typical surface current densities are 15 milliamperes/meter. Thicknesses of the magnetopause and bow shock are typically 150 and 10 km, respectively. The fluctuating velocity of the latter is from 1 to 10 km/sec and its excursion is of the order of several hundred to a few thousand km under relatively quiescent conditions.Dissert. Abstr.

N79-13605 California Inst. of Tech., Pasadena.
DETERMINING MODELS OF STRUCTURES FROM EARTHQUAKE RECORDS Ph.D. Thesis
James Leslie Beck 1979 309 p
Avail: Univ. Microfilms Order No. 7824370

The problem of determining linear models of structures from seismic response data is studied using ideas from the theory of system identification. The investigation employs a general formulation called the output-error approach, in which optimal estimates of the model parameters are obtained by minimizing a selected measure-of-fit between the responses of the structure and the model. The question of whether the parameters can be determined uniquely and reliably in this way is studied for a general class of linear structural models. Because earthquake records are normally available from only a small number of locations in a structure, and because of measurement noise, it is shown that it is necessary in practice to estimate parameters of the dominant modes in the records, rather than the stiffness and damping matrices. Two output-error techniques are investigated. Dissert. Abstr.

N79-13606 Minnesota Univ., Minneapolis.
CALCULATION AND OBSERVATION OF THE INFRARED SPECTRAL RADIANCE OF THE CLEAR ATMOSPHERE Ph.D. Thesis
Andrew James Wardrop 1978 130 p
Avail: Univ. Microfilms Order No. 7823970

The infrared spectral emission of the clear atmosphere was calculated from 7 to 14.4 micrometers wavelength and measured from the ground from 4 to 14.4 micrometers. The calculation used a 12 layer atmospheric model. An efficient line by line calculation procedure was developed for determining atmospheric transmission that permitted a large number of emission spectra to be performed economically, with full correction for pressure broadening and temperature effects. The model used actual radiosonde data to determine atmospheric parameters. The radiometer used a liquid helium cooled photoconductive detector. The optical system used an unconventional reference radiation source and had a narrow beamwidth. A circular variable filter was used for wavelength selectivity. The accuracy of the radiometer was not limited by detector noise but by systematic errors of calibration. The comparison of the observed and calculated radiances verified the basic validity of the calculational model, but raised some doubts about the form of the water vapor continuum absorption. Dissert. Abstr.

N79-13607*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC EFFECTS ON CO2 LASER PROPAGATION
S. S. R. Murty (Alabama A and M Univ., Normal) and J. W. Bilbro Nov. 1978 107 p refs
(NASA-TP-1357; M-269) Avail: NTIS HC A06/MF A01 CSCL 04A

An investigation was made of the losses encountered in the propagation of CO2 laser radiation through the atmosphere, particularly as it applies to the NASA/Marshall Space Flight Center Pulsed Laser Doppler System. As such it addresses three major areas associated with signal loss: molecular absorption, refractive index changes in a turbulent environment, and aerosol absorption and scattering. In particular, the molecular absorption coefficients of carbon dioxide, water vapor, and nitrous oxide are calculated for various laser lines in the region of 10.6 mu m as a function of various pressures and temperatures. The current status in the physics of low-energy laser propagation through a turbulent atmosphere is presented together with the analysis and evaluation of the associated heterodyne signal power loss. Finally, aerosol backscatter and extinction coefficients are calculated for various aerosol distributions and the results incorporated into the signal-to-noise ratio equation for the Marshall Space Flight Center system. Author

N79-13608*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
ROCKET OZONE SOUNDING NETWORK DATA Quarterly Report, Dec. 1976 - Feb. 1977
D. U. Wright, A. J. Krueger, and G. M. Foster (NOAA) Dec. 1978 40 p refs
(NASA-TM-69365) Avail: NTIS HC A03/MF A01 CSCL 04A

During the period December 1976 through February 1977, three regular monthly ozone profiles were measured at Wallops Flight Center, two special soundings were taken at Antigua, West Indies, and at the Churchill Research Range, monthly activities were initiated to establish stratospheric ozone climatology. This report presents the data results and flight profiles for the period covered. Author

N79-13609*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETOSPHERIC ELECTROSTATIC EMISSIONS AND COLD PLASMA DENSITIES
R. F. Hubbard and T. J. Birmingham Oct. 1978 43 p refs Submitted for publication
(NASA-TM-79661) Avail: NTIS HC A03/MF A01 CSCL 04A

A synoptic study of electric wave, magnetometer, and plasma data from IMP-6 was carried out for times when banded electrostatic waves are observed between harmonics of the electron gyrofrequency in the earth's outer magnetosphere. Four separate classes of such waves were previously identified. The spatial and temporal occurrences of waves in each class are summarized here, as are correlations of occurrence with geomagnetic activity. Most importantly, associations between the observations of waves of different classes and the relative portions of cold and hot electrons present at the position of the spacecraft are established. Finally, evidence for the signature of the loss cone is sought in the plasma data. G.G.

N79-13610# Computer Corp. of America, Cambridge, Mass.
PROGRAM DESIGN FOR SWF-D: THE SIGNAL WAVEFORM FILE DEMON
Donald E. Eastlake, III and Joanne Z. Sattley 30 Jun. 1978 36 p refs
(Contract N00039-78-C-0246; ARPA Order 3175)
(AD-A058532; CCA-78-10) Avail: NTIS HC A03/MF A01 CSCL 08/11

The seismic data activity sponsored by the Nuclear Monitoring Research Office (NMRO) involves the collection, storage and processing of seismic waveform information as measured by instruments installed throughout the world. The data activity is intended to assist seismologists in exploring techniques for the detection of seismic events, for pinpointing their location, and for recognizing the causes of these events. Author (GRA)

N79-13611# Teledyne Geotechnical, Garland, Tex.
SPECIAL DATA COLLECTION SYSTEMS (PROJECT T/4703) Semiannual Report, Oct. 1977 - Mar. 1978
John R. Sherwin and George C. Kraus 12 May 1978 18 p
(Contract F08606-78-C-0011; ARPA Order 2897)
(AD-A059244; TR-78-2) Avail: NTIS HC A02/MF A01 CSCL 08/11

The work performed under Project T/4703, Special Data Collection Systems, during the period from October 1977 through March 1978 is described. At the start of this period SDCS systems remained in operation at five sites. These were Tatum Dome, Mississippi; Gasbuggy, New Mexico; Houlton, Maine; Red Lake, Ontario; and Oak Springs Butte, Nevada. The first two sites record short-period data on analog tape only. Both short-period and long-period data are recorded on analog and digital recorders at Houlton (KS-36000 system) and Red Lake (surface system). The Oak Springs Butte site records short-period data on both analog and digital recorders. GRA

N79-13612# Soil Dynamics Instruments, Inc., Lexington, Ky.
RESONANT COLUMN TEST Final Report
Vincent P. Drnevich Jul. 1978 82 p refs
(Contract DACW39-77-M-1687)

(AD-A058902; WES-MP-S-78-6) Avail: NTIS HC A05/MF A01 CSCL 08/13

The resonant column test is used to determine by vibration the shear modulus, shear damping, rod modulus (Young's modulus) and rod damping of cylindrical specimens of soil in the undisturbed and remolded conditions. The vibration apparatus, apparatus calibration, and calculations are described. The reduction of all resonant column test data is presented in a computer program. Author (GRA)

N79-13613# ENSCO, Inc., Springfield, Va.
IMPROVED PROCEDURES FOR DETERMINING SEISMIC SOURCE DEPTHS FROM DEPTH PHASE INFORMATION Quarterly Report, 1 Jan. - 31 Mar. 1978
Edward A. Page and Richard Houck May 1978 8 p refs
(Contract F08606-77-C-0007; ARPA Order 1620)
(AD-A059036) Avail: NTIS HC A02/MF A01 CSCL 17/10

All planned program development work on the Seismic Data Analysis Center (SDAC) version of the source depth determination program has been completed. In addition, the program has been modified to process seismograms from the Area of Interest (AI) data set. One event, AI Event No. 1 (7/26/77), was run as a test, and a depth estimate of 21 km was obtained. Author (GRA)

N79-13614# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
LOW ALTITUDE MEASUREMENTS OF PRECIPITATING PROTONS, ALPHA PARTICLES, AND HEAVY IONS DURING THE GEOMAGNETIC STORM OF 26-27 MARCH 1978 Interim Report
Manfred Scholer, Dieter Hovestadt, Gerhard Hartmann, J. Bernard Blake, Joseph F. Fennell, and G. Gloeckler 15 Aug. 1978 39 p refs Prepared in cooperation with Max-Planck-Institut fuer Physik und Astrophysik, Munich and Maryland Univ., College Park
(Contract F04701-77-C-0078)
(AD-A058572; TR-0078(3960-05)-12; SAMSO-TR-78-80) Avail: NTIS HC A03/MF A01 CSCL 04/1

During the geomagnetic storm of 26 March 1976, observations were made of precipitating protons, alpha particles, and heavy ions by two counter telescopes aboard the low-altitude S3-2 satellite. These observations are presented in this paper and their significance discussed. Briefly, a two zone precipitation region is observed on the night side, at L approx 2.7 and L approx 4.0 with an alpha/p ratio of about .008 in the low latitude region and about .0009 at higher latitude at 0.4 MeV/nucleon. The heavier ions, CNO nuclei, are seen in the low latitude zone with a CNO/alpha ratio of about .056 at 0.25 MeV/nucleon. Author (GRA)

N79-13615# Air Force Geophysics Lab., Hanscom AFB, Mass.
AIR FORCE REFERENCE ATMOSPHERES
Allen E. Cole and Arthur J. Kantor 28 Feb. 1978 76 p refs
(AF Proj. 6670)
(AD-A058505; AFGL-TR-78-0051; AFGL-AFSG-382) Avail: NTIS HC A05/MF A01 CSCL 04/1

Sets of mean monthly reference atmospheres that describe seasonal changes in the vertical distributions of temperature, density, and pressure up to 90 km are presented for 15 intervals of latitude between the equator and pole. Specialized atmospheres are included that portray longitudinal variations in monthly median values of temperature, density, and pressure during winter months. Other models illustrate the magnitude of the changes in the vertical distributions of these atmospheric properties during winter warmings and coolings of the stratosphere and mesosphere in arctic and subarctic regions. Estimates of the day-to-day variations around the monthly median values of temperature and density are provided for each set of models. Author (GRA)

N79-13616# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE TOPSIDE IONOSPHERE PLASMA MONITOR (SSIE) FOR THE BLOCK 5D/FLIGHT 2 DMSP SATELLITE
M. Smiddy, R. C. Sagalyn, W. P. Sullivan, P. J. L. Wildman, P. Anderson, and F. Rich (Regis Coll.) 22 Mar. 1978 38 p
(AF Proj. 2311)
(AD-A058503; AFGL-TR-78-0071; AFGL-IP-266) Avail: NTIS HC A03/MF A01 CSCL 04/1

The Topside Ionosphere Plasma Monitor (SSIE) is an operational system flown on the Block 5D F2 DMSP Satellite for transmission of continuous data on the state of the topside ionosphere. The instrument consists of separate electron and ion sensors mounted on a 2.5-ft boom deployed after spacecraft attitude has been stabilized in orbit. This report describes the two sensors, associated electronics, and their operational timelines. The theoretical basis is given for the measurement of a number of plasma parameters: electron temperature and density, ion density, average ion temperature and mean ion mass (for one or two ion species), spacecraft potential, and plasma scale height. Author (GRA)

N79-13617# Air Force Geophysics Lab., Hanscom AFB, Mass.
SPIRE-SPECTRAL INFRARED ROCKET EXPERIMENT (PRELIMINARY RESULTS)
R. M. Nadile, A. T. Stair, Jr., N. B. Wheeler, D. G. Frodsham, and C. L. Wyatt 11 Apr. 1978 20 p refs Presented at 6th Strategic Space Symp., Menlo Park, Calif., Mar. 1978; sponsored by DARPA
(AF Proj. 2310)
(AD-A058504; AFGL-TR-78-0107; AFGL-ERP-630) Avail: NTIS HC A02/MF A01 CSCL 17/5

On 28 Sept., 1977 at 1533 GMT, a Talos Castor rocket carrying the SPIRE payload was launched from the Poker Flat Research Range, Alaska. The objective of the SPIRE experiment, which was supported by the Defense Nuclear Agency, was to obtain infrared emission spectra of the earth's upper atmosphere in a limb-viewing geometry to test theoretical predictions of enhanced nuclear backgrounds. Two cryogenically cooled CVF spectrometers and a dual channel photometer were used to spatially and spectrally map the horizon from 5000 angstrom to 16.5 micro m. All three sensors were telescoped with low scatter optics that resolved an 8 km footprint at the limb while rejecting competitive terrestrial and solar radiation. SPIRE successfully achieved all major objectives, making near simultaneous spectral measurements of both the sunlit and night earth limb in the SWIR and LWIR. Many of the atmosphere's infrared-active species were observed during some 12 separate elevation scans at different azimuth angles from the sun. These include OH, NO, CO2, H2O, O3, and HNO3. Author (GRA)

N79-13618# Naval Research Lab., Washington, D. C.
IONOSPHERIC MODIFICATION: A REPORT ON ARTIFICIALLY CREATED EQUATORIAL SPREAD F. Interim Report
Sidney L. Ossakow, S. T. Zalesak, and Bryant E. McDonald May 1978 37 p
(AD-A058357; AD-E000187) Avail: NTIS HC A03/MF A01 CSCL 04/1

A numerical simulation code for investigating equatorial Spread F in the collisional Rayleigh-Taylor regime is utilized to follow the evolution of artificial plasma density depletions injected into the bottomside nighttime equatorial F region. The 70 km diameter hole rapidly rises and steepens, forming plasma density enhancements at altitudes below the rising hole. The distribution of enhancements and depletions is similar to natural equatorial Spread F phenomena, except it occurs on a much faster time scale. Author (GRA)

N79-13619# Naval Research Lab., Washington, D. C.
MICROWAVE RADIOMETRIC SENSING OF THE MARINE BOUNDARY LAYER Final Report, Fiscal Year 1976 and Fiscal Year 1977
Charles I. Beard and Lee U. Martin Dec. 1977 59 p refs
(AD-A058358; AD-E000188) Avail: NTIS HC A04/MF A01 CSCL 04/1

An experiment in 1975 demonstrated that 22 GHz microwave radiometers could detect, and localize in altitude, long-period (3-15 min) internal gravity waves on low-level atmospheric inversion layers. A second experiment in June 1976 examined atmospheric structure in finer detail by using two 3 deg beamwidth antennas. This has resulted in the first observation and correlation between microwave radiometer beams of short-period (1-2 min), Kelvin-Helmholtz waves. In addition, during slowly varying synoptic conditions, the radiometers followed changes in the height of the inversion base with an average sensitivity of 25 m/deg K. Using an atmospheric quiet period to determine the radiometer

noise level, the resulting vertical resolution of the radiometer is shown to be approximately + or - 1 meter, comparable to active sensors. The observed sensitivities were unaffected by the presence of stratus clouds beneath the inversion. On 19 June 1976, a 5.5 hour sequence of 10 to 11-minute period waves showed recurring internal (gravity) wave propagation from 3 to 4 directions. The corresponding radiometer undulations shifted time-phase 180 deg with the microbarograph surface pressure undulations when the direction of wave propagation changed. Calculation of wave phase velocities based on meteorological soundings favor 2d mode wave propagation, in agreement with the observed wave velocities and microbarograph periodicities.
Author (GRA)

N79-13620# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
ENERGETIC ELECTRONS AT SYNCHRONOUS ORBIT ALTITUDE 1967-1977 Interim Report
George A. Paulikas and J. Bernard Blake 17 Jul. 1978 28 p refs
(Contract F04701-77-C-0078)
(AD-A058454; TR-0078(3960-05)-8; SAMSO-TR-78-75) Avail: NTIS HC A03/MF A01 CSCL 04/1

Data on energetic electron fluxes at the synchronous orbit, covering the 1967-1977 time interval, obtained by experiments flown on the ATS-1, ATS-5 and ATS-6 spacecraft have been combined. The long-term averages of the fluxes of relativistic electrons at the synchronous orbit are relatively constant over this time interval, and flux variations correlate positively with averages of the solar wind velocity. GRA

N79-13621# Photometrics, Inc., Lexington, Mass.
PHOTOGRAPHIC MEASUREMENTS OF ELECTRICAL DISCHARGES Final Report, 1 Feb. 1977 - 28 Feb. 1978
Randall B. Sluder and Irving L. Kofsky 31 Mar. 1978 31 p refs
(Contract F19628-77-C-0124; AF Proj. 7661)
(AD-A058469; PHM-06-78; AFGL-TR-78-0082) Avail: NTIS HC A03/MF A01 CSCL 04/1

Design, fabrication, testing, installation on a sounding rocket equipped with electron and positive-ion accelerators, and flight into the ionosphere of an automatic 16-mm camera are described. A split-field mirror and relay lens system was erected 15 cm outboard from the rocket body for photographing the radiation from electric discharges induced by the potential across an insulating gap separating two sections of the cylindrical body, and the plasma sheath surrounding it. Author (GRA)

N79-13622# Smithsonian Astrophysical Observatory, Cambridge, Mass.
CALCULATIONS PERTAINING TO THE ENERGY BALANCE AND PLASMA MOTIONS IN THE IONOSPHERE Final Report, 1 Oct. 1976 - 31 Dec. 1977
Alex Dalgarno and Eustratios Constantinides Jun. 1978 32 p refs
(Contract F19628-77-C-0030; AF Proj. 2311)
(AD-A058684; AFGL-TR-78-0153) Avail: NTIS HC A03/MF A01 CSCL 04/1

Under the present contract, a research effort was undertaken to develop theoretical and computational techniques pertaining to the energy balance and plasma motions in the ionosphere. Emphasis has been placed on the utilization of available satellite data as input to the calculations and as a test of the validity of the theoretical methods. The effect of ambipolar diffusion on the O(-) concentration profile has been investigated. Calculations show that diffusive transport produces qualitative agreement between observed and calculated profiles. Additional applications are required to produce definitive results. Procedures for the calculation of the rate of energy deposition by solar EUV flux and of the rate of photoionization of the principal atmospheric constituents have been revised. The associated computer codes have been modified or rewritten. The atomic and molecular cross sections utilized by these codes have been updated. The total photoionization cross section of atomic oxygen was revised significantly. Branching ratios for the photoionization of N sub 2 and O sub 2 are substantially different from those used previously. Future work undertaken under contract F19628-78-C-0047 will incorporate electric fields into the transport equations. The study of the spectrum of secondary electrons produced by energetic precipitating particles will be continued under the new contract. Author (GRA)

N79-13623# General Dynamics/Convair, San Diego, Calif.
REMOTE INFRARED ATMOSPHERIC PROFILING SYSTEM (RIAPS) Annual Report
J. Y. Wang 14 Aug. 1978 14 p refs
(Contract N00014-75-C-0940)
(AD-A058641) Avail: NTIS HC A02/MF A01 CSCL 04/1

The method of first-order Taylor expansion is used to study the temperature effect on the transmission function for several narrow spectral intervals in the 15-micron CO2 absorption region with direct application to the problem of thermal remote sounding. Numerical analysis indicates that the computed transmittances are in good agreement with those obtained by line-by-line calculation, especially for spectral intervals with relatively strong temperature dependence. Author (GRA)

N79-13624# Air Force Geophysics Lab., Hanscom AFB, Mass.
ATMOSPHERIC TRANSMITTANCE/RADIANCE: COMPUTER CODE LOWTRAN 4
J. E. A. Selby, F. X. Kneizys, J. H. Chetwynd, Jr., and R. A. McClatchey 28 Feb. 1978 99 p refs
(AD-A058643; AFGL-TR-78-0053; AFGL-ERP-626) Avail: NTIS HC A05/MF A01 CSCL 04/2

This report describes a computer code for predicting atmospheric transmittance and the thermal radiation emitted by the atmosphere and earth in the wavelength range from 0.25 to 28.5 micrometers at a spectral resolution of 20/cm. The program is based on the LOWTRAN 3B (1976) computer code and includes the same data package. The effect of aerosol radiance and nitric acid (HNO3) transmittance and radiance is included. The computer code also contains six standard (geographical and seasonal) atmospheric models and four standard aerosol models with an option to replace either with non-standard or measured values. The program can be run in one of two modes, namely, to compute only atmospheric transmittance (as LOWTRAN 3B) or radiance and atmospheric transmittance for any given path geometry. Author (GRA)

N79-13625# Army Communications Research and Development Command, Fort Monmouth, N. J.
TIME-SERIES MODELING AND ANALYSIS OF HIGH FREQUENCY (HF) VERTICAL AND SHORT-PATH OBLIQUE INCIDENCE IONOSPHERIC SOUNDINGS Final Report
Richard J. Daccardi Jul. 1978 153 p refs
(AD-A058630; CORADCOM-78-7) Avail: NTIS HC A08/MF A01 CSCL 04/1

One example of a non-stationary physical process that influences communications systems can be derived from a millimeter wave link operating over a stable line-of-sight path. Such a system would encounter a rapid change in its propagation path if a heavy rainstorm suddenly disturbed the link. Another example is derived from the adverse effects on high frequency radio communications caused by sudden variations in the ionosphere. Due to the random nature of these phenomena, and due to the time-dependence of experimental information, a logical approach to forecasting these phenomena and interpreting the results seems to lie within the realm of non-stationary time-series modeling. Considering the premise that communications operational effectiveness is dependent on environmental effects, a procedural approach is recommended for characterizing ionospheric effects on High Frequency (HF) Communications utilizing time-series modeling. The recommended technique stresses the structuring of the appropriate difference equations through the criterion of minimum residual variance. GRA

N79-13626# Kanner (Leo) Associates, Redwood City, Calif.
MICROSTRUCTURE OF MAGNETOSPHERIC SUBSTORMS
V. A. Sergeev 1978 20 p refs Transl. into ENGLISH from Mezhduved. Geofiz. Kom. (USSR), no. 21, 1977 p 5-15 Prepared for LASL
(Contract W-7405-eng-36)
(LA-TR-78-49) Avail: NTIS HC A02/MF A01

Available satellite data on the magnetosphere are analyzed starting from new concepts on substorm development with allowance for its microstructure and to explain and prove concepts

of impulsive activization, in the magnetosphere, of regions with other X and Y and to show that the magnetospheric substorm consists of elementary stages (microsubstorms) characterized by a determinate set of terrestrial and magnetospheric phenomena.
Author (DOE)

N79-13627# Addis Translations International, Portola Valley, Calif.
INVESTIGATION OF THE SPECTRA OF SCATTERED GAMMA RADIATION FOR THE INVERSION REGION OF GAMMA-GAMMA SONDES
V. A. Artsybashev and G. A. Ivanyukovich Jun. 1978 12 p refs Transl. into ENGLISH from "Nuclear Geophysical Methods" Novosibirsk, USSR, Nauka Press, 1972 p 99-106 Sponsored by DOE Prepared for Calif. Univ., Livermore. Lawrence Livermore Lab.
(UCRL-Trans-11395) Avail: NTIS HC A02/MF A01

The gamma-gamma method (GGM) is used for sampling the ores of heavy elements (lead, mercury, tungsten, etc.). This method is characterized by rapidity, high performance and efficiency when compared with geological testing methods. Irregularities in the surface under investigation (porosity of the walls of holes, etc.) and variable density in the ores are the serious obstacles that impede successful use of GGM. Inversion sondes have been proposed to eliminate these drawbacks. The results of a study of spectral distribution of scattered gamma radiation in conjunction with two types of inversion sondes are discussed.
DOE

N79-13628# World Meteorological Organization, Geneva (Switzerland).
FIFTH SESSION OF WMO EXECUTIVE INTER-GOVERNMENTAL PANEL ON THE FIRST GARP (GLOBAL ATMOSPHERIC RESEARCH PROGRAM) GLOBAL EXPERIMENT Global Atmospheric Research Program
Dec. 1977 108 p Prepared jointly with ICSU, Rome
Avail: NTIS HC A06/MF A01; WMO, Geneva Sw. Fr. 15

The present status of commitments to the FGGE and contigency planning for the geosynchronous satellite system are outlined. The FGGE implementation operations plan is summarized and the regional experiments are reviewed. Proposed actions and future activities are listed.
ESA

N79-13629# National Oceanic and Atmospheric Administration, Boulder, Colo.
GEODYNAMICS INTERNATIONAL. 12
Apr. 1978 110 p refs Prepared by Inter-Union Comm. on Geodyn., Vancouver (British Columbia)
(PB-284851/3; SE-12; NOAA-78062811) Avail: NTIS HC A06/MF A01 CSCL 08G

An international program of research on the dynamics and dynamic history of the earth is reported that emphasizes deep-seated foundations of geological phenomena. This includes investigations related to movements and deformations, past and present, of the lithosphere and all relevant properties of the earth's interior and especially any evidence for motions at depth.
GRA

N79-13630# National Technical Information Service, Springfield, Va.
ATMOSPHERIC ECHO SOUNDING. A BIBLIOGRAPHY WITH ABSTRACTS Progress Reports, 1964 - Aug. 1978
Audrey S. Hundemann Aug. 1978 96 p Supersedes NTIS/PS-77/0815; NTIS/PS-76/0698; NTIS/PS-75/641; NTIS/PS-75/045
(NTIS/PS-78/0916/3; NTIS/PS-77/0815; NTIS/PS-76/0698; NTIS/PS-75/641; NTIS/PS-75/045) Avail: NTIS HC $28.00/MF $28.00 CSCL 04B

Abstracts pertaining to equipment, design, and use of acoustic sounders are presented. Use of the sounders to sense the atmosphere for weather changes, temperature inversions, aircraft wakes, ionospheric properties, and other characteristics are discussed. This bibliography contains 90 abstracts.
GRA

N79-13631# National Oceanic and Atmospheric Administration, Boulder, Colo.
URSI HANDBOOK OF IONOGRAM INTERPRETATION AND REDUCTION, SECOND EDITION, NOVEMBER 1972, REVISION OF CHAPTERS 1-4
W. R. Piggott, ed. and K. Rawer, ed. Jul. 1978 142 p refs Prepared in cooperation with Radio and Space Research Station, Slough, England and Arbeitsgruppe fuer Physikalische Weltraumforschung, Freiburg, West Germany
(PB-285994/0; UAG-23A) Avail: NTIS HC A07/MF A01 CSCL 04A

Instructions suitable for use at individual ionospheric stations forming the worldwide network are provided. Basic theory, conventions, determination of hourly numerical values, daily tabulation of hourly values, topside sounder ionograms, Es parameters, and the f plot are discussed.
GRA

N79-13632# Massachusetts Inst. of Tech., Cambridge. Constructed Facilities Div.
THREE-DIMENSIONAL STABILITY OF SLOPES Final Report, 15 Mar. 1976 - 31 Aug. 1978
Amr S. Azzouz and Mohsen M. Baligh Jun. 1978 351 p refs (Grant NSF ENG-75-20887)
(PB-285740/7; R78-8) Avail: NTIS HC A16/MF A01 CSCL 08K

The classical circular arc method of analysis is extended to three-dimensional problems by considering failures with finite lengths along shear surfaces of revolution. A computer program (STAB3D) is developed to evaluate the three-dimensional factor of safety of slopes. Results of analyses are presented in the form of charts which illustrate the importance of different factors on stability and can be used for the design of slopes with a uniform cross section. Four case studies of embankments rapidly loaded to failure on saturated clay foundations are analyzed. A new correction factor for field vane shear strength data is obtained from the above four case studies and from fourteen additional embankment failures.
GRA

N79-13633# National Geodetic Survey, Rockville, Md.
APPLICATION OF THREE-DIMENSIONAL GEODESY TO ADJUSTMENTS OF HORIZONTAL NETWORKS
T. Vincenty and B. R. Bowring Jun. 1978 17 p
(PB-286672/1; NOAA-TM-NOS-NGS-13) Avail: NTIS HC A02/MF A01 CSCL 08G

A method is proposed for adjustment of directions and distances in space with heights held fixed and without reductions of observations to the ellipsoid. Programming hints are included to reduce the time needed for forming observation equations. The adjustments can be performed in the rectangular or in the geographic coordinate system. This method is simpler and faster than customary methods.
GRA

N79-13634# National Technical Information Service, Springfield, Va.
SEISMOLOGY, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1976 - Sep. 1978
Audrey S. Hundemann Oct. 1978 167 p Supersedes NTIS/PS-77/0963; NTIS/PS-76/0916; NTIS/PS-75/769; NTIS/PS-75/059
(NTIS/PS-78/1105/2; NTIS/PS-77/0963; NTIS/PS-76/0916; NTIS/PS-75/769; NTIS/PS-75/059) Avail: NTIS HC $28.00/MF $28.00 CSCL 08K

Abstracts pertaining to seismic wave propagation, earthquake prediction, and geomorphology and geomechanics associated with earthquake activity primarily in the United States and Asia are presented. Instrumentation and processing of seismic data are included. This updated bibliography contains 260 abstracts, 90 of which are new entries to the previous edition.
GRA

N79-13635# National Technical Information Service, Springfield, Va.
PALEOMAGNETISM. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1978
George W. Reimherr Nov. 1978 126 p Supersedes NTIS/PS-77/1028; NTIS/PS-76/0956; NTIS/PS-75/852
(NTIS/PS-78/1159/9; NTIS/PS-77/1028; NTIS/PS-76/0956; NTIS/PS-75/852) Avail: NTIS HC $28.00/MF $28.00 CSCL 08N

The direction and intensity of the earth's magnetic field through geologic time, particularly as related to plate tectonics are reported. This updated bibliography contains 120 abstracts, 7 of which are new entries to the previous edition.
GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N79-13636 California Univ., Davis.
MATHEW: A MASS-CONSISTENT WIND FIELD MODEL Ph.D. Thesis
Christine Sygitowicz Sherman 1978 98 p
Avail: Univ. Microfilms Order No. 7822673

MATHEW, a regional three-dimensional time-dependent wind field model, utilizes a variational analysis technique to determine a three-component non-divergent velocity field which can be used to provide the advection velocities in atmospheric pollutant transport and diffusion models. The regions of interest have horizontal distances of 10-200 km and extend less than 2 km above topography. The MATHEW model was applied to four geographic areas of the United States. These applications were selected to represent a variety of terrain features, meteorological conditions and data availability. The MATHEW model incorporates terrain explicitly, is site independent, uses available meteorological measurements, and is computationally stable. With two to three minutes of CPU time and 80 percent of large-core memory on a CDC 7600, a three-dimensional wind field can be calculated at 29,000 grid points above a moderately complicated terrain area for a variety of common meteorological conditions. Dissert. Abstr.

N79-13637 California Univ., Los Angeles.
DEVELOPMENT AND OBSERVATIONAL VERIFICATION OF A CUMULUS CLOUD PARAMETERIZATION Ph.D. Thesis
Stephen John Lord 1978 393 p
Avail: Univ. Microfilms Order No. 7823387

The parameterization with an emphasis on the physical basis of the closure assumption is reviewed. The application of the parameterization to a model discretized both in the vertical and in time is described. Methods for calculation of the large-scale forcing and the mass flux kernel in the discrete model are developed. Several solution methods for the mass flux distribution equation are presented and tested. This discrete model is applied to an observational verification of the cloud work function quasi-equilibrium and the parameterization as a whole.
Dissert. Abstr.

N79-13638 California Univ., Los Angeles.
A WIND TUNNEL STUDY ON THE GROWTH OF GRAUPEL Ph.D. Thesis
John Christian Pflaum 1978 126 p
Avail: Univ. Microfilms Order No. 7823395

Utilizing the UCLA cloud tunnel, graupel grown from frozen drops was studied for a variety of growth conditions. The following parameters were varied: (1) initial frozen drop size; (2) ambient temperature; (3) liquid water content; (4) growth time; and (5) cloud droplet size. An experimental method is described from which the growth rates, collection kernels and densities of the graupel were determined. The density (N2O sub rime) of ice accreted by the growing graupel was measured and plotted. The results yielded the following empirical relationship: rho sub rim.e = 0.261 (-rV sub o/T sub s) to the 0.38 power. The hydrodynamic behavior of riming frozen drops and riming simulated in ice crystals plates was studied. Dissert. Abstr.

N79-13639 Wisconsin Univ. - Madison.
CLOUD HEIGHT DETERMINATION FROM GEOSYNCHRONOUS SATELLITE IMAGES Ph.D. Thesis
William Riley Bryson, II 1978 100 p
Avail: Univ. Microfilms Order No. 7817097

Determination of cloud heights from two images separated by spatial angle is essentially a problem in the measurement of angles. The methods of cloud height determination described in this thesis are based on the inherent angular accuracy and optical fidelity of the spin-scan satellite camera. This allows precise translation of an image from one satellite to the projection of another satellite, thereby allowing the use of cross-correlation to measure parallax. In practice it is difficult to provide exactly simultaneous scanning of any point on earth. Therefore, compatibility was maintained with the Space Science and Engineering Center's WINDCO system to allow correction of errors due to cloud motion. Finally, as a result of the remapping of large areas, 3-D images of clouds were produced.
Dissert. Abstr.

N79-13640 Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
CLIMATIC ATLAS OF THE OUTER CONTINENTAL SHELF WATERS AND COASTAL REGIONS OF ALASKA. VOLUME 1: GULF OF ALASKA Final Report
William A. Brower, Jr., Henry F. Diaz, Anton S. Prechtel, Harold W. Searby, and James L. Wise 1977 878 p refs Original contains color illustrations Prepared in cooperation with Environ. Data Serv., Asheville, N. C. 3 Vol.
(Grant NOAA-03-5-022-56)
(AEIDC-Publ-B-77-Vol-1; LC-77-620020) Avail: AEIDC, 707 A Street, Anchorage, Alaska 99501 HC $5.00

An attempt is made to establish the present knowledge of climatological conditions of the marine and near coastal areas that are important to resource development of the outer continental shelf of Alaska. This volume presents a climatic atlas for the Gulf of Alaska. Presented are maps, graphs and tables. Statistical detail means, extremes, and percent frequency of occurrence of threshold values for the following elements are presented: wind, visibility, present weather; sea level pressure, temperature, clouds, and waves; and such supplemental information as storm surges, tides, sea ice, surface currents, bathymetry, detailed weather, and aviation weather. Two other volumes accompany this volume; The Bering Sea (Vol. 2) and The Chuckchi and Beaufort Sea (Vol. 3). G.Y.

N79-13641 Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
CLIMATIC ATLAS OF THE OUTER CONTINENTAL SHELF WATERS AND COASTAL REGIONS OF ALASKA. VOLUME 2: BERING SEA Final Report
William A. Brower, Jr., Henry F. Diaz, Anton S. Prechtel, Harold W. Searby, and James L. Wise 1977 886 p refs Original contains color illustrations Prepared in cooperation with Environ. Data Serv., Asheville, N. C. 3 Vol.
(Grant NOAA-03-5-022-56)
(AEIDC-Publ-B-77-Vol-2; LC-77-620026) Avail: AEIDC, 707 A Street, Anchorage, Alaska 99501 HC $5.00

Volume 2 of this three volume series is presented. This volume presents climatological conditions in the marine and near coastal area of Alaska, in the Bering Sea region, that are important to resource development of the outer continental shelf. Maps, graphs, and tables are presented in this atlas for a detailed climatic profile of this region. Two other volumes accompany this volume; The Gulf of Alaska (Vol. 1) and The Chuckchi and Beaufort Seas (Vol. 3). G.Y.

N79-13642 Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
CLIMATIC ATLAS OF THE OUTER CONTINENTAL SHELF WATERS AND COASTAL REGIONS OF ALASKA. VOLUME 3: CHUKCHI-BEAUFORT SEA Final Report
William A. Brower, Jr., Henry F. Diaz, Anton S. Prechtel, Harold W. Searby, and James L. Wise 1977 816 p refs Original contains color illustrations Prepared in cooperation with Environ. Data Serv., Asheville, N. C. 3 Vol.
(Grant NOAA-03-5-022-56)
(AEIDC-Publ-B-77-Vol-3; LC-77-620027) Avail: AEIDC, 707 A Street, Anchorage, Alaska 99501 HC $5.00

Volume 3 of a three volume series is presented. Climatological conditions in the marine and near coastal area of Alaska for the Chuckchi and Beaufort Seas area are presented. Maps, graphs, and tables in this atlas are presented to give a detailed climatic profile of this area. The other volumes in this series include: The Gulf of Alaska (Vol. 1) and The Bering Sea (Vol. 2). G.Y.

N79-13643*# Tennessee Univ. Space Inst., Tullahoma.
INVESTIGATION OF AIRCRAFT LANDING IN VARIABLE WIND FIELDS
Walter Frost and Kapuluru Ravikumar Reddy Dec. 1978 93 p refs
(Contract NAS8-29584)
(NASA-CR-3073; M-272) Avail: NTIS HC A05/MF A01 CSCL 04B

A digital simulation study is reported of the effects of gusts and wind shear on the approach and landing of aircraft. The gusts and wind shear are primarily those associated with wind fields created by surface wind passing around bluff geometries characteristic of buildings. Also, flight through a simple model of a thunderstorm is investigated. A two-dimensional model of aircraft motion was represented by a set of nonlinear equations which accounted for both spatial and temporal variations of winds. The landings of aircraft with the characteristics of a DC-8 and a DHC-6 were digitally simulated under different wind conditions with fixed and automatic controls. The resulting deviations in touchdown points and the controls that are required to maintain the desired flight path are presented. The presence of large bluff objects, such as buildings in the flight path is shown to have considerable effect on aircraft landings. G.G.

N79-13644*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PARAMETER ESTIMATION APPLIED TO NIMBUS 6 WIDE-ANGLE LONGWAVE RADIATION MEASUREMENTS
Richard N. Green and G. Louis Smith Dec. 1978 40 p refs
(NASA-TP-1307; L-12233) Avail: NTIS HC A03/MF A01 CSCL 04B

A parameter estimation technique was used to analyze the August 1975 Nimbus 6 Earth radiation budget data to demonstrate the concept of deconvolution. The longwave radiation field at the top of the atmosphere is defined from satellite data by a fifth degree and fifth order spherical harmonic representation. The variations of the major features of the radiation field are defined by analyzing the data separately for each two-day duty cycle. A table of coefficient values for each spherical harmonic representation is given along with global mean, gradients, degree variances, and contour plots. In addition, the entire data set is analyzed to define the monthly average radiation field. Author

N79-13645# Army Communications Research and Development Command, Fort Monmouth, N. J.
TIME-SERIES MODELING OF RAINFALL DENSITY INFORMATION Final Report
Richard J. Daccardi Jul. 1978 41 p refs
(AD-A058699; CORADCOM-78-6) Avail: NTIS HC A03/MF A01 CSCL 04/2

In the literature there are basically two approaches to the prediction of climatological occurrence (rainfall) statistics: (1) One can use large numbers of observations of climatological phenomena to compile statistics on the probability of occurrence. (2) One can use computational models and available climatological data (past history) to calculate occurrence statistics. Recent modeling attempts start with very small point rainfall distribution functions which are transformed into specific attenuation data. The point rainfall rates are based upon a large history of data which does not indicate the spatial variation of rain. There are, however, indications that outage time on line-of-sight communication links can be estimated from distributions of point rainfall rates. Due to the random nature of rainfall, and due to the time dependence of such information, a logical approach to forecasting this phenomenon and interpreting the results with respect to systems performance seems to lie within the realm of non-stationary time-series modeling. This report presents an attempt to develop statistical models which can be used to forecast in near-real-time and to characterize the underlying stochastic processes of short-term rainfall density information. It should be mentioned that the analysis and modeling are directed towards the accurate characterization of precipitation density and not the probability of precipitation occurrence. Due to the wavelengths involved in Line-of-Sight Communication links, i.e., 5-30 GHz, the size of raindrops have a definite dispersive and absorptive effect on propagated electromagnetic energy. The importance, therefore, of this work is self-evident. GRA

N79-13646# Army Electronic Warfare Lab., White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
THE 14822B LANCE MISSILE NUMBER 3329, ROUND NUMBER 314 AST
Jul. 1978 36 p
(DA Proj. 1T6-65702-D-127)
(AD-A058779; ECOM-DR-973) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 14822B Lance, Missild Number 3329, Round Number 314 AST, are presented in tabular form. Author (GRA)

N79-13647# Army Electronic Warfare Lab., White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
THE 12832A LANCE MISSILE NO. 3330, ROUND NO. 315 ACT Meteorological Data Report
Jul. 1978 36 p
(DA Proj. 1T6-65702-D-127)
(AD-A058778; ECOM-DR-974) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12832A Lance, Missile Number 3330, Round Number 315 ACT, are presented in tabular form. Author (GRA)

N79-13648# Army Electronic Warfare Lab., White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
THE 12830C LANCE MISSILE NO. 3338, ROUND NO. 316 ESL
Aug. 1978 37 p
(DA Proj. 1T6-65702-D-127)
(AD-A058777; ECOM-DR-975) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12830C Lance, Missile Number 3338, Round Number 316 ESL, are presented in tabular form. Author (GRA)

N79-13649# Scripps Institution of Oceanography, La Jolla, Calif.
NORPAX ADS REPORT NUMBER 2 Report, Mar. - May 1977
Steven Pazan Nov. 1977 39 p
(Contract N00014-75-C-0152)
(AD-A058956; SIO-REF-77-30) Avail: NTIS HC A03/MF A01 CSCL 04/2

Contour maps of monthly meaned air temperature, sea temperature, wind direction, wind speed, surface vapor pressure, and 700 mb heights are presented. Calculations of wind stress, wind stress curl, wind shear velocity cubed, sensible heat flux, and latent heat flux are included. S.B.S.

N79-13650# Scripps Institution of Oceanography, La Jolla, Calif.
NORPAX ADS REPORT NUMBER 1 Report, Jun. 1976 - Feb. 1977
Steven Paxan Oct. 1977 81 p refs
(Contract N00014-75-C-0152)
(AD-A058955; SIO-REF-77-19) Avail: NTIS HC A05/MF A01 CSCL 04/2

During the ADS meeting of March 16, 1977 it was decided to produce a NORPAX ADS program data report for trimonthly periods roughly corresponding to seasons. This is the first issue of that data report, and contains contour maps of monthly meaned: FNWC air temperature, sea temperature, wind speed, wind direction, surface vapor pressure, and 700 mb heights; NORPAX calculated wind stress, wind stress curl, wind shear velocity cubed (U-cubed), sensible heat flux, latent heat flux; objectively analyzed TRANSPAC temperatures at discrete depths from White and Bernstein (SIO). This report also contains monthly drifter buoy displacement vectors from Kirwan (TAMU) and McNally (SIO). GRA

N79-13651# Air Force Geophysics Lab., Hanscom AFB, Mass.
DEVELOPMENT OF A CORONA ANEMOMETER FOR MEASUREMENT OF STRATOSPHERIC TURBULENCE Final Report
R. E. Good and J. H. Brown 21 Mar. 1978 46 p refs
(AF Proj. 6687)
(AD-A058960; AFGL-TR-78-0070; AFGL-IP-265) Avail: NTIS HC A03/MF A01 CSCL 04/2

The length of time pollution remains in the stratosphere depends upon the intensity of stratospheric turbulence. Measurement of stratospheric turbulence has been limited due to the lack of a suitable instrument. A new instrument has been developed to meet this need. The corona anemometer sensor development is described from the physical principles of operation through the electronic circuitry, laboratory and in-flight calibrations to the first test flight. The corona anemometer measures the

stratospheric wind and turbulence by detecting the amount of displacement the corona ion beam suffers in transversing a one inch gap exposed to the horizontal wind. The instrument response is linear and has a frequency response from 0 to 2000 Hz, sufficient to measure atmospheric turbulence directly. The use of this instrument in the measurement of stratospheric turbulence will significantly enhance the knowledge of stratosphere properties and improve the accuracy of environmental assessments.
Author (GRA)

N79-13652# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ATMOSPHERIC LIQUID WATER AND RAINFALL RATE DETERMINATION OVER LAND SURFACES USING THE NIMBUS 6 SCANNING MICROWAVE SPECTROMETER M.S. Thesis - Utah Univ.
Alan Douglas Duff Mar. 1978 72 p refs
(AD-A058397; AFIT-CI-78-61) Avail: NTIS HC A04/MF A01 CSCL 04/2

The purpose of this study is to determine water vapor and liquid water content from the Nimbus 6 SCAMS instrument over land surfaces. The radiative properties of clouds and precipitation in the SCAMS channels are investigated using the discrete-ordinate method for approximating the solution of the radiative transfer as it is applied to nonisothermal, inhomogeneous cloudy atmospheres. An examination of the problem of variations in surface emissivity over land in the microwave spectrum is included. Analysis of the upwelling radiances from the model in the presence of clouds indicates that the concentration of water vapor and liquid water in atmospheres over land surfaces has a consistent and predictable effect on the observed brightness temperatures. The results of the theoretical calculations are parameterized and an empirical method to derive water vapor and liquid water from the observed upwelling radiances is described. Satellite passes from five days over the United States are used to test the empirical parameterizations of the theoretical results. The empirically derived liquid water contents for two days are compared with synoptic discussions and NOAA 4 satellite mosaics, as well as previous infrared research for the same time period (Feddes and Liou, 1978). GRA

N79-13653# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A STUDY OF SUPERCELL CLOUD TOP TEMPERATURE SIGNATURES FROM GOES ENHANCED INFRARED IMAGERY M.S. Thesis - Utah Univ.
Peter Benton Mills Mar. 1978 74 p refs
(AD-A058398; AFIT-CI-78-62) Avail: NTIS HC A04/MF A01 CSCL 22/2

This thesis investigated a case where enhanced infrared (EIR) imagery provided unique information about convective penetration above the tropopause for a severe weather situation over the central United States. This situation was unique because warm spots appeared over cumulonimbus tops in the GOES EIR imagery (Mills and Astling, 1977). The warm spots corresponded to locations where radar observations indicated intense convection with tropopause penetrating tops had occurred. Generally, one would expect the overshooting tops to appear as cold areas in satellite infrared and enhanced infrared imagery because of moist adiabatic cooling in ascending convective motion. Since GOES imagery is an important tool in severe local storm detection and prediction, and since enhancement of GOES data only became operational in early 1976, this investigation attempts to provide an explanation for the appearance of warm spots. Additionally, situations where warms spots did not occur are discussed. GRA

N79-13654# Naval Weather Service Detachment, Asheville, N. C.
STUDY OF WORLDWIDE OCCURRENCE OF FOG, THUNDERSTORMS, SUPERCOOLED LOW CLOUDS AND FREEZING TEMPERATURES, CHANGE 1 Reference Report, 1854-1976
1 Sep. 1978 215 p Revised
(AD-A058496; NAVAIR-50-1C-60-Change-1) Avail: NTIS HC A10/MF A01 CSCL 04/2

This report consists of seven sets of charts containing monthly or seasonal isopleth analysis of fog, supercooled fog, freezing temperatures, thunderstorms, supercooled stratus and the freezing level on a worldwide basis. In addition, the frequency of fog is presented in tabular format by station on a worldwide basis for the mid-season month. Author (GRA)

N79-13655# Environmental Research and Technology, Inc., Concord, Mass.
EVALUATION OF UNCERTAINTIES IN THE ESTIMATION OF HYDROMETER MASS CONCENTRATIONS USING SPANDAR DATA AND AIRCRAFT MEASUREMENTS
Robert K. Crane May 1978 109 p refs
(Contract F19628-76-C-0069; AF Proj. 627A)
(AD-A059223; AFGL-TR-78-0118; SCIENTIFIC-1) Avail: NTIS HC A06/MF A01 CSCL 04/2

Knowledge of the ice, snow, and water particle environment is required during the erosion testing of supersonic vehicles launched from the NASA Wallops Flight Center. The mass concentrations of hydrometeors along the vehicle trajectory were estimated using measurements from the SPANDAR radar. Aircraft measurements were obtained in the vicinity of the vehicle trajectory prior to or after the launch. The objective of this uncertainty analysis is to review the radar and aircraft measurement procedures and to assess the error bounds or uncertainties for the mass concentration estimates. The important error contributions were radar calibration, polarization effects, length-to-mass conversion from the particle measurements, distribution estimates, and extrapolation limitations. GRA

N79-13656# Army Command and General Staff Coll., Fort Leavenworth, Kansas.
MODELED METEOROLOGICAL INPUTS TO ENVIRONMENT DEPENDENT SIMULATION STUDIES Final Report. M.S. Thesis
Douglas A. Abbott 9 Jun. 1978 76 p refs
(AD-A058336) Avail: NTIS HC A05/MF A01 CSCL 04/2

A stochastic model demonstrates low-cost meteorological support to environment dependent simulation studies. Only the univariate problem is demonstrated, but extensions to multivariate applications are feasible. This application models atmospheric visibility. The model simulates time series at a given geographical point. A historically derived cumulative frequency distribution is converted to its equivalent normal deviate and fitted by a rational approximation. A Markovian time dependence is assumed. Seasonal and diurnal cycles are modeled. Subsequent values are generated using a time-correlation weighted linear combination of the prior value and a unit normal random input. This produces a Brownian Movement phenomena within the appropriate probability density function. A given run tends to regress toward the climatological mean while exhibiting random fluctuations. A run of sufficient length recreates the probability density functions. Results presented verify model performance against historical data and include a few applications. GRA

N79-13657# SRI International Corp., Arlington, Va.
FEATURES OF ENERGY-BUDGET CLIMATE MODELS: AN EXAMPLE OF WEATHER DRIVEN CLIMATE STABILITY
H. D. I. Abarbanel Sep. 1978 37 p refs
(Contracts DAHC15-73-C-0370; MDA903-78-C-0086)
(AD-A058635; SRI-JSR-77-45) Avail: NTIS HC A02/MF A01 CSCL 04/2

The essential features of zonally-averaged energy budget models of the earth's climate are reviewed and abstracted to give an effective potential for the appropriate climate variables.
Author (GRA)

N79-13658# Sandia Labs., Albuquerque, N. Mex.
GENERATION OF A TYPICAL METEOROLOGICAL YEAR
I. J. Hall, R. R. Prairie, H. E. Anderson, and E. C. Boes 1978 3 p Presented at Analysis for Solar Heating and Cooling, San Diego, Calif., 27 Jun. 1978
(Contract EY-76-C-04-0789)
(SAND-78-1096C; Conf-780639-1) Avail: NTIS HC A02/MF A01

A method for generating a typical meteorological year (TMY) was developed. The developed method was used to generate a TMY for each of the 26 SOLMET Rehabilitation Stations that have hourly data. The meteorological measures used to select the TMY were: dry bulb temperature; dew point temperature;

wind velocity; and solar radiations on a horizontal surface-standard year corrected. Most SOLMET Stations have data available over a 23 year period beginning in 1953 and extending through 1975. The process used to select a TMY for a given station involves selecting, by statistical methods, one typical meteorological month (TMM) for each of the twelve calendar months from the 23 year period and catenating the twelve months to form a TMY. Thus, the TMY for each station consists of 12 months of actual meteorological data selected from the long term data base from that station, 23 years in most cases. A TMY at a given station could, for example, consist of January 1955, February 1966, March 1962, ... December 1973. DOE

N79-13659# World Meteorological Organization, Geneva (Switzerland).
SECOND PLANNING MEETING FOR THE WEST AFRICAN MONSOON EXPERIMENT (WAMEX) AND PREPARATORY MEETING OF THE WAMEX SCIENTIFIC AND MANAGEMENT REGIONAL COMMITTEE (WSMRC) Global Atmospheric Research Program
1978 111 p Conf. held at Geneva, 10-14 Oct. 1977 Prepared jointly with ICSU, Rome
(GARP-Spec-Rept-27) Avail: NTIS HC A06/MF A01; WMO, Geneva Sw. Fr. 25

Reviews of the GARP monsoon subprogram and the revised draft scientific and observational proposal for the West African Monsoon Experiment (WAMEX) are given. The surface and upper air observational networks are described together with the FGGE composite network, marine observations and satellite data. The data management and operational control systems are summarized, the status of oceanographic program planning is reported, and national activities and further planning in preparation for WAMEX are discussed. ESA

N79-13660# National Weather Service, Salt Lake City, Utah.
FLASH-FLOOD PROCEDURE
Ralph C. Hatch and Gerald Williams May 1978 33 p refs
(PB-286014/6; NOAA-TM-NWS-WR-130; NOAA-78072601) Avail: NTIS HC A03/MF A01 CSCL 04B

Streamflow forecasts can be made by a local user with input data collected by the user or in cooperation with other agencies including the National Weather Service. This particular procedure was developed for use under circumstances where limited data may be available and estimates may be required. The results received from this procedure are based on defined 100-year 24-hour return period precipitation amounts from many years of data. A self-help procedure that could be quickly and easily used in estimating runoff from thunderstorms in small basins (generally less than 200 square miles) was presented. This procedure is made up of three parts: A storm rainfall/duration graph; an area graph; and a total flow chart. GRA

N79-13661# Syracuse Research Corp., N. Y.
CITIZEN PARTICIPATION MECHANISMS AND WEATHER MODIFICATION POLICY: A SURVEY Final Report, 1970 - 1977
Thomas A. Dorsey and Henry W. Lambright Apr. 1978 179 p refs
(Grant NSF OSS-77-19066)
(PB-284246/6; SRC-TR-78-516; NSF/OSS-78/04) Avail: NTIS HC A09/MF A01 CSCL 04B

The role of citizen participation, and formal mechanisms for such participation, in the formation of policy about weather modification in the 50 states is surveyed. The survey discussed (1) the actual events which have occurred from 1970 through 1977 involving citizen response to cloud seeding, (2) the regulatory statutes covering the technology, as they pertain to citizens participating in making decisions about its use, and (3) the relationship between the general citizen participation literature, technology, and the cases relating to weather modification, as well as suggestions for further research. Citizen activities concerning cloud seeding, using both formal and informal mechanisms are discussed. GRA

N79-13662# Environmental Data Service, Washington, D. C.
MARINERS WEATHER LOG, VOLUME 22, NO. 4, JULY 1978
Elwyn E. Wilson Jul. 1978 86 p
(PB-286226/6; NOAA-78072702) Avail: NTIS HC A05/MF A01 CSCL 04B

In addition to its regular sections this issue contains the following articles: A revised Atlantic tropical cyclone climatology; Western North Pacific typhoons, 1977; and The Blizzard of '78. GRA

N79-13663# National Meteorological Center, Washington, D. C.
SEMI-IMPLICIT HIGHER ORDER VERSION OF THE SHUMAN-HOVERMALE MODEL
Kenneth A. Campana Apr. 1978 55 p refs
(PB-286012/0; NOAA-NWS-NMC-61; NOAA-TM-NUS-NMC-61; NOAA-78080201) Avail: NTIS HC A04/MF A01 CSCL 04B

The atmospheric numerical model developed by Shuman and Hovermale at the National Meteorological Center was reformulated for semi-implicit integration. Orography, moisture, friction, and diabatic effects were incorporated into this new model. Higher order horizontal finite differencing is used in the advective terms of the model equations to reduce truncation error. Forecasts were made for a number of real data cases using a time step up to 45 minutes, and the semi-implicit technique has proven stable to at least 7 days. GRA

N79-13664# National Meteorological Center, Washington, D. C.
ADDITION OF OROGRAPHY TO THE SEMI-IMPLICIT VERSION OF THE SHUMAN-HOVERMALE MODEL
Kenneth A. Campana Apr. 1978 17 p refs
(PB-286009/6; NOAA-TM-NWS-NMC-62; NOAA-78080202) Avail: NTIS HC A02/MF A01 CSCL 04B

The semi-implicit version of the Shuman-Hovermale model now includes orography. The incorporation of mountains into the model was made with great difficulty and is documented in the report. Care must be taken when splitting the pressure gradient term in the equations of motion into implicit and explicit parts. The orographic effect on the pressure gradient term is exhibited in two ways: as the gradient of surface geopotential and as the gradient of surface pressure. These two effects must be calculated together as either implicit or explicit parts in order that the long time step will not cause serious orographic-related truncation errors. GRA

N79-13665# National Hurricane Center, Coral Gables, Fla.
THE DEADLIEST, COSTLIEST, AND MOST INTENSE UNITED STATES HURRICANES OF THE CENTURY (AND OTHER FREQUENTLY REQUESTED HURRICANE FACTS)
Paul J. Hebert and Glenn Taylor Aug. 1978 30 p refs
(PB-286753/9; NOAA-TM-NWS-NHC-7) Avail: NTIS HC A03/MF A01 CSCL 04B

Lists of United States hurricanes which have caused 25 or more deaths and fifty million dollars or more in damages (unadjusted) during this century were compiled from all data sources available at the National Hurricane Center. In addition, all major hurricanes which made landfall in the United States during this century are listed. Some additional statistics on United States hurricanes of this century and tropical cyclones in general are also presented. GRA

N79-13666# National Technical Information Service, Springfield, Va.
FOG DISPERSAL. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Oct. 1978
Robena J. Brown Oct. 1978 228 p Supersedes NTIS/PS-77/1024; NTIS/PS-76/0835; NTIS/PS-75/750; NTIS/PS-75/099 (NTIS/PS-78/1123/5; NTIS/PS-77/1024; NTIS/PS-76/0835; NTIS/PS-75/750; NTIS/PS-75/099) Avail: NTIS HC $28.00/MF $28.00 CSCL 04B

A bibliography containing 222 abstracts concerned with fog dispersal techniques primarily concentrating on dispersal at airports is presented. The physics and chemistry of fog dispersal, dispersing chemicals, the use of helicopter downwash to remove fog, and electrical dispersing methods are included. GRA

N79-13667# National Technical Information Service, Springfield, Va.
ICE FOG. A BIBLIOGRAPHY WITH ABSTRACTS Prog-

rese Report, 1964 - Oct. 1978
Robena J. Brown Oct. 1978 65 p Supersedes NTIS/PS-77/1014; NTIS/PS-76/0881; NTIS/PS-75/770
(NTIS/PS-78/1124/3; NTIS/PS-77/1014; NTIS/PS-76/0881; NTIS/PS-75/770) Avail: NTIS HC $28.00/MF $28.00 CSCL 08L

Citations relating to ice formation, modification, dispersal and forecasting are presented. Problems of white outs and thermal pollution effects in arctic regions are discussed. This updated bibliography contains 58 abstracts. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N79-13668 Oregon State Univ., Corvallis.
SUBMARINE HYDROTHERMAL SYSTEMS: VARIATIONS IN MINERALOGY, CHEMISTRY, TEMPERATURES AND THE ALTERATION OF OCEANIC LAYER 2 Ph.D. Thesis
Debra Sue Stakes 1978 198 p
Avail: Univ. Microfilms Order No. 7822136

The pervasive interactions between seawater and oceanic crust are recorded in secondary mineral assemblages in altered oceanic rocks. These assemblages characterize a sequence of reactions initiated at the mid-ocean spreading center and continuing until the crust cools and becomes exposed to seawater at low temperatures. This sequence reflects variations in temperature, pH, oxygen fugacity, availability of important cations and water-rock ratios. Rapid cooling of flow interiors or intrusives by seawater injection, the quench reactions, produces actinolite, talc, smectite, chlorite, phlogopite, albite and apatite in coarse-grained rocks. This alteration occurs at temperatures estimated at 400-700 C and results in the formation of Fe and Mn-enriched hydrothermal solutions. Dissert. Abstr.

N79-13669*# National Ocean Survey, Rockville, Md.
LUNAR TIDAL ACCELERATION OBTAINED FROM SATELLITE-DERIVED OCEAN TIDE PARAMETERS Final Report
Clyde C. Goad and Bruce C. Douglas Oct. 1978 18 p refs
(NASA Order P-62871-G)
(NASA-CR-156842) Avail: NTIS HC A02/MF A01 CSCL 08C

One hundred sets of mean elements of GEOS-3 computed at 2-day intervals yielded observation equations for the M sub 2 ocean tide from the long periodic variations of the inclination and node of the orbit. The 2nd degree Love number was given the value k sub 2 = 0.30 and the solid tide phase angle was taken to be zero. Combining obtained equations with results for the satellite 1967-92A gives the M sub 2 ocean tide parameter values. Under the same assumption of zero solid tide phase lag, the lunar tidal acceleration was found mostly due to the C sub 22 term in the expansion of the M sub 2 tide with additional small contributions from the O sub 1 and N sub 2 tides. Using Lambeck's (1975) estimates for the latter, the obtained acceleration in lunar longitudal in excellent agreement with the most recent determinations from ancient and modern astronomical data. G.G.

N79-13670# Naval Research Lab., Washington, D. C. Applied Ocean Acoustics Branch.
BATHYMETRIC EFFECTS ON THREE-DIMENSIONAL RAY TRACES Interim Report
Robert N. Dewitt Apr. 1978 13 p refs
(ZF5255201)
(AD-A058585; AD-E000196) Avail: NTIS HC A02/MF A01 CSCL 20/1

Many ray tracing programs allow for a sloping or structured bottom but completely ignore the fact that the vector normal to the bottom can have an out-of-plane component. To ignore this in long range propagation over irregular bottoms is to assume cylindrical symmetry of the bathymetry about the source, a condition rarely realized in at-sea experiments. This paper describes a preliminary effort to devise and apply a numerical technique to demonstrate the three-dimensional effects of ray tracing over actual seamounts, ridges and basin walls. Author (GRA)

N79-13671# Alpine Geophysical Associates, Inc., Norwood, N. J.
ACOUSTIC AND GEOPHYSICAL SURVEY OF BOTTOM AND SUB-BOTTOM REFLECTION LOSS, AREA A, PART 2 Final Report
William T. McGuinness and Charles B. Officer 1978 63 p
(Contract N62306-1442)
(AD-A059102) Avail: NTIS HC A04/MF A01 CSCL 20/1

On all of the bottom and sub-bottom reflectivity graphs, the ordinate scale is reflectivity. In this case it is synonymous with bottom reflection loss. A reflectivity of 5 db on these graphs means that there is a bottom reflection loss of 5 db. Increase in reflectivity means decrease in bottom loss. On these same graphs the abscissa scale is grazing angle. An angle of 90 deg is normal incidence and angle of 0 deg is grazing incidence. On the theoretical derivations the complement of this angle is used. GRA

N79-13672# Hawaii Univ., Honolulu.
CIRCULATION ATLAS FOR OAHU, HAWAII
Karl H. Bathen Apr. 1978 100 p refs
(Grant NOAA-04-5-158-17)
(PB-286016/1; UNIHI-SEAGRANT-MR-78-05; NOAA-78072606) Avail: NTIS HC A05/MF A01 CSCL 08C

The first comprehensive analysis and summary of all circulation observations taken to date around Oahu, Hawaii is provided. Detailed descriptive maps showing all seasonal characteristics of the circulation patterns observed or believed to exist around Oahu are included. GRA

N79-13673# National Ocean Survey, Rockville, Md.
TIDE TABLES 1979: HIGH AND LOW WATER PREDICTIONS, CENTRAL AND WESTERN PACIFIC OCEAN AND INDIAN OCEAN
1978 392 p
(PB-285598/9; NOAA-78072003) Avail: NTIS HC A17/MF A01 CSCL 08C

Full daily predictions for 74 reference stations and differences and other constants for about 1,900 stations are presented. Also included are: a table for obtaining the approximate height of the tide at any time; a table of local mean time of sunrise and sunset for every fifth day of the year for different latitudes; a table for the reduction of local mean time to standard time; a table for converting feet to meters; a table of the Greenwich mean time of the moon's phases, apogee, perigee, greatest north and south and zero declination; the time of the solar equinoxes and solstices; and a glossary of terms. GRA

N79-13674# Scripps Institution of Oceanography, La Jolla, Calif.
MEASUREMENTS OF TURBULENCE, TEMPERATURE AND SALINITY MICROSTRUCTURE IN THE UPPER LAYERS OF THE OCEAN: INTERCOMPARISON TEST. PRELIMINARY RESULTS OF US-USSR OCEANIC MICROSTRUCTURE INTERCOMPARISON EXPERIMENT Final Report
John C. Schedvin, Carl H. Gibson, and Tom K. Deaton May 1978 48 p refs
(Grant NOAA-04-6-022-44016)
(PB-286781/0; NOAA-78083006) Avail: NTIS HC A03/MF A01 CSCL 08J

Small scale fluctuations of temperature, conductivity and velocity were measured from towed bodies at depths from 10-1000 meters. Results of US temperature measurements below the base of a wind mixed layer are presented. Four vertical regions are differentiated on the basis of local temperature profiles and the activity and anisotropy of the microstructure. An actively turbulent stratified region was identified above an inactive homogeneous layer by comparing the measured spectra to universal similarity forms for actively turbulent temperature and fossil temperature turbulence. A temperature inversion was found below these layers separated from them by a multi-layered strong gradient region, possibly produced through the mechanisms of double diffusion. Tests of anisotropy and estimates of dissipation rates are presented based on spectral analysis conditioned on depth and angle of package tow. GRA

N79-13675# Hawaii Univ., Honolulu. Sea Grant Coll. Program.
BEACH AND SURF PARAMETERS IN HAWAII

Final Report
Franciscus Gerritsen Jun. 1978 192 p refs
(Grants NOAA-04-3-158-29; NOAA-2-35243)
(PB-286736/4; UNIHI-SEAGRANT-TR-78-02;
NOAA-78082806) Avail: NTIS HC A09/MF A01 CSCL 08C

Three classes of beaches are studied: primary beaches on the island of Oahu; beaches on Oahu protected by headlands and/or subject to strong seasonal variation; and beaches on the neighbor islands with special characteristics, e.g., cusps or natural offshore formations. The data collected during field studies, such as recordings of wave heights and periods, tides, current velocities and directions; beach profiles, and sand movements are presented. Aerial and ground-level photographs from known elevations provided overall dimensional and descriptive data for the beaches. The major causes of erosion were found to be a relatively strong rip current generated by southern swells and heavy storms from the northwest during the winter months giving rise to dynamic changes of these exposed beaches. Dynamic beach behavior and stability of headland beaches are included. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N79-13676*# National Aeronautics and Space Administration, Washington, D. C.
THE EFFECTS OF STRONG SHOCK WAVES ON MORTALITY RATES AND PERCENTAGES OF PULMONARY LESIONS IN RATS AS A FUNCTION OF THE NUMBER OF EXPOSURES
Patrick Vassout and Georges Parmentier Dec. 1978 13 p refs Transl. into ENGLISH of 'Etude des Effets des Ondes de Choc Fortes sur les Taux de Letalite et les pourcentages de Lesions Pulmonaires chez le Rat en Fonction du Nombre d'Expositions' Inst. Franco-Allemand de Rech., St. Louis, France, 1978 p 1-13 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75598) Avail: NTIS HC A02/MF A01 CSCL 06C

The results of the study reveal that with regard to the pulmonary lesions, twice the number of exposures is compensated for by quartering the overpressure of the wave crest. With regard to the mortality rates, it reveals that halving the overpressure of the wave crest is offset by a 20-fold increase in the number of exposures. G.Y.

N79-13677# Battelle Pacific Northwest Labs., Richland, Wash.
PACIFIC NORTHWEST LABORATORY REPORT FOR 1977 TO THE DOE ASSISTANT SECRETARY FOR ENVIRONMENT. PART 2: ECOLOGICAL SCIENCES
B. E. Vaughan Feb. 1978 162 p refs
(Contract EY-76-C-06-1830)
(PNL-2500-Pt-2) Avail: NTIS HC A08/MF A01

An understanding of the behavior and fate of airborne pollutants following interception by plant foliage was developed. Submicron (less than 1 micrometers) particles intercepted by plant canopies behaved differently, with respect to retention time on foliage, than greater than 10 micrometers particles. Submicronic particles were shown (respiratory size range) to be effectively intercepted and retained on plant foliage. Even under rigorous leaching conditions, greater than 70 percent of the deposited Am is retained. The data also suggest that retention tends to increase with residence time on foliage. Transport studies showed a significant fraction of the foliar deposits to be transported to roots and seed. The quantity transported to these tissues tends to increase following leaching treatments (simulated rainfall). DOE

N79-13678# National Technical Information Service, Springfield, Va.
ECOSYSTEM MODELS, VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1977 - Oct. 1978
Elizabeth A. Harrison Oct. 1978 44 p Supersedes NTIS/PS-77/1011; NTIS/PS-76/0904; NTIS/PS-75/846
(NTIS/PS-78/1146/6; NTIS/PS-77/1011; NTIS/PS-76/0904; NTIS/PS-75/846) Avail: NTIS HC $28.00/MF $28.00 CSCL 06F

The preparation and use of ecosystem models are covered in this bibliography of Federally-funded research. Models for marine biology, wildlife, plants, water pollution, microorganisms, food chains, radioactive substances, limnology, and diseases as related to ecosystems are included. This updated bibliography contains 38 abstracts, all of which are new entries to the previous edition. GRA

N79-13679# National Technical Information Service, Springfield, Va.
ECOSYSTEM MODELS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1975 - Nov. 1977
Elizabeth A. Harrison Oct. 1978 187 p
(NTIS/PS-78/1145/8) Avail: NTIS HC $28.00/MF $28.00 CSCL 06F

The preparation and use of ecosystem models are covered in this bibliography of Federally-funded research. Models for marine biology, wildlife, plants, water pollution, microorganisms, food chains, radioactive substances, limnology, and diseases as related to ecosystems are included. This bibliography contains 181 abstracts, none of which are new entries to the previous edition. GRA

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N79-13680 California Univ., Davis.
NONSHIVERING THERMOGENESIS IN NORMAL AND DYSTROPHIC MUSCLE Ph.D. Thesis
Nancy Jane Tesky 1978 99 p
Avail: Univ. Microfilms Order No. 7822678

Experiments were performed using normal and dystrophic hamsters. In vivo recordings of membrane potential and resistance were made in hindlimb muscles to determine the effects of norepinephrine (experimental) and saline (control) i.v. injections. In vitro studies to determine the rate constants of Na-22 efflux from normal and dystrophic muscle with and without ouabain addition were performed. In vivo studies of the effects of alpha- and beta-adrenergic agonists on membrane potentials of normal hamsters were conducted. These experiments demonstrate that i.v. NE administration to anesthetized hamsters is followed by a significant depolarization of the cell membranes of skeletal muscles in normal and dystrophic hamsters accompanied by a decrease in membrane resistance in both types of animals. Results of the rate constant study show that normal and dystrophic muscles extrude sodium at identical rates with and without ouabain inhibition of the sodium pump. The results are interpreted as indicating that both adrenergic pathways are involved in the adrenergic-induced responses of the muscle membrane nonshivering thermogenesis. Dissert. Abstr.

N79-13681* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY. A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 186
Nov. 1978 54 p
(NASA-SP-7011(186)) Avail: NTIS HC E03 CSCL 06E

This bibliography lists 159 reports, articles, and other documents introduced into the NASA Scientific and Technical Information System in October 1978. Author

N79-13682* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 185
Oct. 1978 61 p
(NASA-SP-7011(185)) Avail: NTIS HC E03 CSCL 06E

This bibliography lists 187 reports, articles, and other documents introduced into the NASA scientific and technical information system in September 1978. Author

N79-13683 Rochester Univ., N. Y.
DIFFRACTION-BASED CHARACTERIZATION OF BIOLOGICAL TISSUE WITH ULTRASOUND Ph.D. Thesis
Robert Marc Lerner 1978 147 p
Avail: Univ. Microfilms Order No. 7818272

A model for inferring tissue structure from ultrasonic scattering measurements was developed by considering tissue to be a relatively homogeneous weak scattering medium which redirects only a fraction of the incident sound power from the beam. Mathematical analysis shows that the scattered sound wave may be interpreted in terms of the Fourier transform of the acoustic refractive index variations in tissue. Three types of targets were illuminated with ultrasound and the scattered signals were measured as a function of frequency or angle. Both swept-frequency and angle scan data on crosslinked dextran particles show trends in which smaller particles scatter acoustic power at greater angles off axis. Preliminary swept-frequency and angle scan data from human liver tissue demonstrates that the technique is sensitive to the tissue structure and, hence, pathology. Dissert. Abstr.

N79-13684 Duke Univ., Durham, N. C.
NONINVASIVE ESTIMATION OF BILIRUBIN AND HEMOGLOBIN OXYGEN SATURATION IN THE SKIN BY REFLECTION SPECTROPHOTOMETRY Ph.D. Thesis
Robert Alan Bruce 1978 202 p
Avail: Univ. Microfilms Order No. 7821295

A method is presented here for the estimation of serum bilirubin in infants from the spectral reflectance of the skin. Measurements were made with a specially designed reflectance spectrophotometer which allowed reflectance to be measured at many wavelengths with high speed. Reflectance measurements were obtained for the skin of a group of jaundiced Gunn rats whose serum bilirubin levels had been controlled with the drug cholestyramine. Skin reflectance data were also obtained for a group of jaundiced infants with a wide range of skin melanin pigmentation. These measurements were related to serum bilirubin values obtained by analysis of blood samples. Dissert. Abstr.

N79-13685# Federal Aviation Administration, Washington, D. C. Office of Aviation Medicine.
PSYCHOPHYSIOLOGICAL EFFECTS OF AGING: DEVELOPING A FUNCTIONAL AGE INDEX FOR PILOTS. 2: TAXONOMY OF PSYCHOLOGICAL FACTORS
Siegfried G. Gerathewohl Mar. 1978 76 p refs
(FAA-AM-78-16) Avail: NTIS HC A05/MF A01

Three methodological approaches are used to determine the psychological and psychophysiological factors, which are thought to be representative of and essential to effective pilot performance. They consist of (1) the analysis of successful pilot behavior as displayed under simulated and operational conditions, (2) the analysis of unsuccessful pilot behavior (pilot error) as related to aircraft accidents, and (3) the evaluation of pilot performance during the selection and training procedures as reported in the literature. By means of factor analyses, logical deductions, and clinical interpretations of the results obtained by various investigators, 14 factors are identified and described, namely (1) perception, (2) attention, (3) reaction, (4) orientation, (5) sensorimotor, (6) stamina, (7) cognition/mentation, (8) interpersonal relations, (9) decision making, (10) experience, (11) learning, (12) personality, (13) mechanical ability, and (14) motivation. The relationship of these factors to age and the aging pilot is discussed. S.B.S.

N79-13686*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHYSIOLOGICAL RESPONSES OF WOMEN TO SIMULATED WEIGHTLESSNESS: A REVIEW OF THE FIRST FEMALE BED-REST STUDY
Harold Sandler and David L. Winter 1978 92 p refs
(NASA-SP-430) Avail: NTIS HC A05/MF A01 CSCL 06S

Subjects were exposed to centrifugation, to lower body negative pressure (LBNP), and to exericse stress both before and after bed rest. Areas studied were centrifugation tolerance, fluid electrolyte changes and hematology, tolerance to LBNP, physical working capacity, biochemistries, blood fibrinolytic activity, female metabolic and hormonal responses, circadian alterations, and gynecology. Results were compared with the responses observed in similarly bed-rested male subjects. The bed-rested females showed deconditioning responses similar to those of the males, although with some differences. Results indicate .that women are capable of coping with exposure to weightlessness and, moreover, that they may be more sensitive subjects for evaluating countermeasures to weightlessness and developing criteria for assessing applicants for shuttle voyages. G.G.

N79-13687*# National Aeronautics and Space Administration, Washington, D. C.
PAUL BERT
J. Colin Dec. 1978 23 p Transl. into ENGLISH from Science (France), no. 12, Oct. 1978 p 27-33 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75599) Avail: NTIS HC A02/MF A01 CSCL 06P

This biographical article on Paul Bert highlights his studies on the physiology of respiration and barometric pressure and, in particular his contributions to the understanding of hypoxia, hyperoxia and anesthesia. Author

N79-13688# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
AERODYNAMIC FORCES EXERTED ON AN ARTICULATED HUMAN BODY SUBJECTED TO WINDBLAST Final Technical Report, 1 Mar. 1977 - 28 Feb. 1978
Daniel J. Schneck 12 Jun. 1978 21 p refs
(Grant AF-AFOSR-3296-77; AF Proj. 2312)
(AD-A059023; AFOSR-78-1147TR) Avail: NTIS HC A02/MF A01 CSCL 01/3

This report describes an extension of a mathematical model previously developed to study the forces to which an ejection seat occupant is exposed during high-speed ejections. The forces which tend to dislodge two limbs from one another, or from a restraining surface are calculated to exceed 600 pounds for Mach numbers above 0.7. It is concluded that, for high angles of attack, a pilot's musculo-skeletal system is not likely to withstand this tendency for dislodgement from a restraining surface and consequently, windblast and flail injuries are probable. Author (GRA)

N79-13689# Franklin Inst. Research Labs., Philadelphia, Pa. Science Information Services Dept.
BIOLOGICAL EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION. VOLUME 2, NUMBER 4: A DIGEST OF CURRENT LITERATURE Quarterly Report, Mar. - Jun. 1978
Bruce H. Kleinstein and Elena P. Saboe Jun. 1978 94 p
(Contract TP-7AC024)
(AD-A055569; FIRL-80G-C4735-01-Vol-2-4) Avail: NTIS HC A05/MF A01 CSCL 06/16

This quarterly digest presents current awareness information on the biological effects of nonionizing electromagnetic radiation (microwave and radiofrequency) in the range of 0 Hz to 100 GHz. The effects of magnetic and electric fields (static and alternating) are also covered. Each issue contains abstracts of English and foreign current literature, summaries of ongoing research investigations, news items, and a directory of meetings and conferences. Author (GRA)

N79-13690# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AIRCREW INFLIGHT PHYSIOLOGICAL DATA ACQUISITION SYSTEM 2 M.S. Thesis
Joseph Gregory Jolda and Stephen John Wanzek Dec. 1977 179 p refs
(AD-A055638; AFIT/GE/EE/77-21) Avail: NTIS HC A09/MF A01 CSCL 06/16

This paper discusses a second generation microprocessor-based prototype system to acquire, analyze, and store selected environmental and physiological data from a pilot during flight. The Aircrew Inflight Physiological Data Acquisition System (IFPDAS) II consists of an input multiplexer and analog-to-digital converter, a heart rate detector, a microprocessor, and a permanent memory device. The microprocessor's operating system monitors eight sensors, extracts desired information, and stores these reduced in permanent memory. After the flight these data are

transferred to a land-based computer which completes the data processing and graphs the following environmental and physiological information versus flight time: (1) cabin absolute pressure, (2) cabin altitude, (3) Z-G's, (4) heart rate, (5) breathing rate, (6) minute ventilation volume, (7) inspired oxygen quantity, and (8) expired oxygen quantity. The completed IFPDAS II prototype provides the desired information well within the required accuracy. GRA

N79-13691# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.

NONIONIZING RADIATION PROTECTION SPECIAL STUDY: INFRARED RADIATION HAZARD EVALUATION OF THE ROTARY FORGE, WATERVLIET ARSENAL, WATERVLIET, NEW YORK, MARCH - APRIL 1978

W. J. Marshall Jun. 1978 15 p refs
(AD-A055643; USAEHA-42-0360-78) Avail: NTIS HC A02/MF A01 CSCL 06/16

The rotary forge at Watervliet Arsenal was surveyed for infrared hazards on 9-10 March 1978. It was found that levels of infrared exceeding protection standards for 10-second exposures were present at distances less than approximately 3 meters from the radiation source. This radiation would, however, be easily detected by exposed personnel due to body heating and would not, therefore, present a serious health hazard due to whole-body heating. However, eye protection against infrared was deemed necessary due to possible cataract formation from repeated exposures. Author (GRA)

N79-13692# Letterman Army Inst. of Research, San Francisco, Calif.

HONEST 1: PERSONALITY, HEART RATE, URINARY CATECHOLAMINE, AND SUBJECTIVE FATIGUE MEASURES RELATED TO NIGHT NAP-OF-THE-EARTH FLYING Final Report, Sep. - Nov. 1976

David A. Stamper, Bruce C. Leibrecht, and Andree J. Lloyd Jan. 1978 45 p refs
(DA Proj. 3M1-61102-BS-02)
(AD-A054888; LAIR-51) Avail: NTIS HC A03/MF A01 CSCL 06/16

Personality, subjective fatigue, urine catecholamine, and heart rate measures of helicopter pilots that participated in a night nap-of-the-earth training exercise were evaluated. These selected variables provided estimates of normal personality function, subjective feeling states, and biochemical and physiological changes. According to the hypothesis, these variables are related to night nap-of-the-earth flying. Scores on the Self-acceptance and Achievement via Independence scales of the California Psychological Inventory (CPI) were significantly above the mean for pilots rated as above average ability. Additionally, the CPI scales of Self Control and Good Impression were significantly related to urine catecholamine levels. Heart rate levels were significantly related to epinephrine, but not to norepinephrine. Despite the significant increases in epinephrine within flights and norepinephrine across flights, there were no significant increases in preceived anxiety, as measured by the State-Trait Anxiety Inventory. The lack of increase in perceived anxiety may be explained by the processes of dissociation and the general adaptation syndrome. Author (GRA)

N79-13693# Army Aeromedical Research Lab., Fort Rucker, Ala.

THE EFFECT OF NAP-OF-THE-EARTH (NOE) HELICOPTER FLYING ON PILOT BLOOD AND URINE BIOCHEMICALS Final Report

David B. Anderson, Roderick J. McNeil, Martha L. Pitts, and Dorolyn A. Perez-Poveda Jul. 1977 23 p refs
(AD-A055204; USAARL-77-20) Avail: NTIS HC A02/MF A01 CSCL 06/19

Selected blood and urine chemistries were compared in helicopter pilots flying alternately nap-of-the-earth (NOE) and routine flight profiles. The NOE flights resulted in significantly higher urinary catecholamine excretion (P less than .05), serum uric acid (P less than .05) and blood lactic acid (P less than .01). Preflight cortisol was significantly higher than post-flight (P less than .01), and post-flight catecholamine excretion rate was higher than during the three hour post-flight sample period (P less than .01). The biochemical results are consistent with the reports that NOE flight is physically more demanding in terms of muscular strain. The increased catecholamine excretion may indicate the perception of NOE flight as a more demanding and stressful activity than flight at higher altitudes. In light of previous work, the higher serum uric acid levels prior to NOE flight may provide a measure of the pilot's psychological preparation and possible performance during NOE flight. Author (GRA)

N79-13694# Army Aeromedical Research Lab., Fort Rucker, Ala.

THE INTERACTION OF CARBON MONOXIDE AND ALTITUDE ON AVIATOR PERFORMANCE: PATHOPHYSIOLOGY OF EXPOSURE TO CARBON MONOXIDE

Joseph C. Denniston, Frank S. Pettyjohn, James K. Boyter, John K. Kelliher, Bruce F. Hiott, and Charles F. Piper Apr. 1978 46 p refs
(AD-A055212; USAARL-78-7) Avail: NTIS HC A03/MF A01 CSCL 06/19

A reappraisal of the interaction of carbon monoxide and altitude is presented in light of current concepts of the pathophysiology of low level exposure to carbon monoxide. The review includes a discussion of: (1) the potential sources of carbon monoxide; (2) the factors affecting the absorption, transport, and elimination of carbon monoxide; (3) the effects of carbon monoxide on human health and cognitive function; (4) the interaction of carbon monoxide and altitude, and resulting hypoxia; (5) the concept of equivalent physiological altitudes; (6) predictable effects of transient elevation in carbon monoxide; (7) limits of carbon monoxide exposure; and (8) the basic pathophysiological changes occuring with hypobaric hypoxia and/or carbon monoxide hypoxia. Author (GRA)

N79-13695# Army Aeromedical Research Lab., Fort Rucker, Ala.

CONTRAST SENSITIVITY OF THE HUMAN EYE TO VARIOUS DISPLAY PHOSPHOR TYPES

Robert W. Verona Apr. 1978 8 p refs
(AD-A058383) Avail: NTIS HC A02/MF A01 CSCL 17/2

Observer threshold performance data was obtained using sine wave and tactical vehicle imagery displayed on television monitors, each with a different phosphor screen. Display performance was measured using sine waves and in scanning spectroradiometer. Author (GRA)

N79-13696# School of Aerospace Medicine, Brooks AFB, Tex.

MINUTEMAN MISSILE CREW FATIGUE AND 24-HOUR ALERTS Final Report, May 1977 - Feb. 1978

William F. Storm and Stephen F. Gray May 1978 15 p
(AF Proj. 7930)
(AD-A056561; SAM-TR-78-19) Avail: NTIS HC A02/MF A01 CSCL 06/19

A battery of psychobiological measures was used to evaluate the degree of fatigue experienced by missile crews performing 24-hour continuous duty alert tours at Minuteman launch control centers. Operationally significant findings relative to the duty schedule occurred for subjective fatigue scores, hours slept per day, and urinary outputs of 17-OHCS, sodium, and potassium. The moderate postalert fatigue and physiologic cost present at the end of the 24-hour alerts were ameliorated by one night of undisturbed sleep. Values indicative of severe crew fatigue or stress were never attained for any of the measures. A buildup of cumulative fatigue over several alerts could be avoided by scheduling a minimum of two consecutive nights sleep at home between alerts. The impact of the duty schedule on contingency and emergency situations was also considered. Author (GRA)

N79-13697# Washington Univ., Seattle.

GAS EXCHANGE UNDER ENVIRONMENTAL STRESS Final Report, 4 Nov. 1975 - 3 Feb. 1978

Harold I. Modell and Michael P. Hlastala Jul. 1978 72 p refs
(Contract F41609-76-C-0016)
(AD-A058242; SAM-TR-78-24) Avail: NTIS HC A04/MF A01 CSCL 06/19

The purpose of this project was threefold: (1) to assemble available information concerning the effects of various environmental factors such as altitude, acceleration, and breathing gas

composition on gas exchange, (2) to initiate a mathematical simulation of gas exchange between atmosphere and tissues that would predict the effects of these factors on gas exchange at rest and during exercise, and (3) to identify areas for future experimental investigation. A computer model which includes a multi-compartment lung and lumped tissue beds representing brain, heart, muscle, and the remaining tissues was developed. Inputs are barometric pressure, inspired oxygen and carbon dioxide concentrations, carboxyhemoglobin concentration, acceleration in the z vector, and oxygen consumption. Steady state values are calculated for gas exchange parameters in the lungs and in the four tissue compartments. The simulation is designed in a modular fashion to enhance the ability to modify it as additional experimental data become available. The model provides qualitatively accurate predictions of experimental data showing responses to a single stress. Extensive experimental data of responses to multiple stresses with which to compare model predictions are not available. Results with multiple stresses indicate that experimental work aimed at better definition of minute to minute control of ventilation is necessary. GRA

N79-13698# Louisville Univ., Ky. Dept. of Ophthalmology.
MECHANISMS OF RETINAL DAMAGE FROM CHRONIC LASER RADIATION: THRESHOLDS AND MECHANISMS
Theodore Lawwill, Steve Crockett, and Glenna Currier Aug. 1977 43 p refs
(Contract DAMD17-74-C-4026; DA Proj. 3E7-62772-A-813) (AD-A058449; AR-4) Avail: NTIS HC A03/MF A01 CSCL 20/5

The effect upon the retina of exposure to large fields of bright visible light has been evaluated. The thresholds for permanent retinal damage for four hour exposures in rhesus monkeys have been established for white light, and laser lines of 514.5 nm, 488 nm, 457.9 nm, and 590 nm. The damage has been evaluated by ophthalmoscopy, electroretinography and light and electron microscopy. The shortest wavelength light (457.9 nm) is more effective in causing damage, particularly histological damage, which is spread throughout the fundus and throughout the retina layers. Functional damage shown by the electroretinogram follows a different action spectrum without the increased effect in the blue. There appears to be more than one mechanism for retinal damage in chronic light exposure, and at least one mechanism is not dependent solely upon the visual pigment and the pigment epithelium. Thresholds of permanent damage appear to be within one or two log units of light levels encountered in the normal visual environment. Newer data suggest that this damage is additive. Daily one hour exposures for four days produce damage equivalent to a single four hour exposure at the same retinal irradiance. Author (GRA)

N79-13699# School of Aerospace Medicine, Brooks AFB, Tex.
FIGHTER INDEX OF THERMAL STRESS: DEVELOPMENT OF INTERIM GUIDANCE FOR HOT-WEATHER USAF OPERATIONS Interim Report, Jul. - Sep. 1977
Richard F. Stribley and Sarah A. Nunneley Feb. 1978 22 p refs
(AF Proj. 7930)
(AD-A053471; SAM-TR-78-6) Avail: NTIS HC A02/MF A01 CSCL 06/19

Operation of fighter and trainer aircraft in hot climates can impose significant heat strain on aircrew members. Until now, commanders have lacked practical guidance for aircrew thermal protection. A primary obstacle has been the paucity of data relating cockpit conditions to ground weather, but that gap is now being filled. A review of existing heat-stress indices revealed that none of them met the the criteria for operational practicality. The Wet Bulb Globe Temperature (WBGT) Index was selected as a starting point because of the large data base already available. A new scheme was then developed, the Fighter Index of Thermal Stress (FITS), which uses recently acquired cockpit data to generate predictive equations. The final product is a single table from which base personnel, using only conventional weather data (ambient air temperature and relative humidity), can read FITS values. Normal, Caution, and Danger Zones are designated on the chart, based upon estimates of aircrew physiological status and the need to avoid significant performance decrements. Appropriate protection procedures are recommended for each zone. Author (GRA)

N79-13700# Health Effects Research Lab., Research Triangle Park, N. C. Environmental Toxicology Div.
BIOMEDICAL DATA VALIDATION THROUGH AN ON-LINE COMPUTER SYSTEM
Larry Claxton May 1978 16 p refs Sponsored by EPA
(PB-285249/9; EPA-600/1-78-038) Avail: NTIS HC A02/MF A01 CSCL 06E

Since health and regulatory decisions are being based upon the results of many short term tests conducted in many laboratories, a computerized system for an assurance of quality control would be valuable. This paper presents how quality assurance controls were included within the computer programming for a short term test-the Salmonella suspension assay for mutagenesis. GRA

N79-13701# Colorado Univ., Denver. Medical Center.
NONINVASIVE ASSESSMENT OF PULMONARY HYPERTENSION Annual Report, Jun. 1977 - May 1978
John T. Reeves 27 Jul. 1978 41 p refs
(Contract N01-HR-62920)
(PB-285121/0; NIH-N01-HR-62920-2A) Avail: NTIS HC A03/MF A01 CSCL 06E

A long range Doppler and experience were utilized to visualize the pulmonary artery and its flow from an esophageal and a frontal approach. Importance was placed on measuring pulse wave velocity. An initial computer program was developed which indicates that it is possible to discriminate between two pulse waves narrowly separated in time. GRA

N79-13702# Transportation Systems Center, Cambridge, Mass.
EFFECTS OF DECELERATION AND RATE OF DECELERATION ON LIVE SEATED HUMAN SUBJECTS Final Report
C. N. Abernethy, G. R. Plank, and E. D. Sussman Oct. 1977 26 p refs
(PB-284653/3; DOT-TSC-UMTA-77-44) Avail: NTIS HC A03/MF A01 CSCL 13F

Seated human subjects were tested to determine the maximum deceleration and rate of change of deceleration (jerk) at which the majority of users of Automated Guideway Transportation Systems could remain securely in their seats. The study was designed to determine deceleration levels necessary to dislodge passengers under normal seating conditions and to determine optimum deceleration and jerk levels which maximizes the passenger flow rate while minimizing injuries to passengers. The tests support the use of forward-facing, back-tilted seating to permit high decelerations with a low incidence of passenger dislodgement. GRA

N79-13703# Southwest Research Inst., San Antonio, Tex.
THE DISTRIBUTION OF CADMIUM AND OTHER METALS IN HUMAN TISSUES
D. E. Johnson, R. J. Prevost, J. B. Tillery, and R. E. Thomas May 1978 250 p refs
(Contract EPA-68-02-1725)
(PB-285200/2; EPA-600/1-78-035) Avail: NTIS HC A11/MF A01 CSCL 06T

The relationship between cadmium, lead, zinc and mercury burdens and age was studied in five different autopsy tissues. Approximately 30 autopsy cases in each of five age groups were evaluated. Autopsy cases were from sudden or accidental death victims. Histories were collected on all cases to ascertain that a non-exposed population - with regards to cadmium - was sampled. Information on cigarette smoking, diseases, etc. was also collected. A concurrent epidemiological study was constructed to investigate the cadmium concentrations in urine and feces of persons (six age groups) not exposed to cadmium. Statistical evaluation of the data was performed. Interrelationships between all autopsy tissues for each metal were examined. Total body burdens of cadmium were calculated for standard man. GRA

N79-13704# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Medical and Biologic Effects of Environmental Pollutants.
ZINC
May 1978 742 p refs
(Contract EPA-68-02-1226)
(PB-285130/1; EPA-600/1-78-034) Avail: NTIS

HC A99/MF A01 CSCL 06T

The available information on zinc as it relates to its effects on man and his environment is summarized. Trace amounts of zinc are essential for normal growth in plants, animals and humans, however, excessive levels can bring on zinc toxicosis. Zinc deficiency is known to have caused congenital malformations in pregnant rats. Severe liver disease is commonly associated with loss of total body zinc. Reports suggest humans may ingest 500 mg or 1 g or more daily without adverse effects. Ten or more g taken as a single oral dose may produce gastrointestinal distress, including nausea, vomiting and diarrhea. GRA

N79-13705# National Technical Information Service, Springfield, Va.

THE TOXICOLOGY OF OZONE. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Oct. 1978

Edward J. Lehmann Oct. 1978 89 p

(NTIS/PS-78/1120/1) Avail: NTIS HC $28.00/MF $28.00 CSCL 06T

The toxic effects of ozone on humans, animals, and plants are cited. The effects of ozone generated as a photochemical oxidant from air pollution and the basic biological effects of ozone are discussed. Ozone's effects on forests and agricultural crops, industrial exposure, maximum exposure levels, effects of microorganisms, and physiological effects are described. This bibliography contains 85 abstracts. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N79-13706# Washington Univ., Seattle. Dept. of Psychology.

LIFE STRESS, ORGANIZATIONAL STRESS, AND JOB SATISFACTION

Irwin G. Sarason and James H. Johnson Mar. 1978 15 p refs

(Contract N00014-75-C-0905)

(AD-A055153; SCS-LS-004) Avail: NTIS HC A02/MF A01 CSCL 05/9

The present study was designed to investigate the relationship between changes, experienced both within the personal lives of individuals and within the work environment, and job satisfaction. Results suggest that negative life changes experienced within one's personal life are related to lower levels of satisfaction while both positive and negative changes experienced within the work environment are correlated with satisfaction, positive changes being related to higher levels and negative changes being related to lower levels of satisfaction. The implications of these findings for assessing organizational stress and for the prediction of attrition from organizations are discussed.

Author (GRA)

N79-13707# Air Force Human Resources Lab., Brooks AFB, Tex.

METHODOLOGY TO ASSESS PSYCHOLOGICAL STRESS AND ITS IMPACT IN THE AIR COMBAT ENVIRONMENT Final Report, 1 Sep. - 31 Dec. 1977

Jeffrey E. Kantor, Lawrence Klinestiver, and Terry A. McFarlane Mar. 1978 15 p refs

(AD-A053474; AFHL-TR-78-3) Avail: NTIS HC A02/MF A01 CSCL 05/10

Operations within an air combat environment are typically associated with subjective feelings of strain, pressure, and tension. These feelings are refered to as stress and can impact on performance within the combat setting. To identify which pilot operations commonly produce stress, to assess the level of stress generated by those operations, and to evaluate the impact of stress on combat performance, a Combat Stress Questionnaire was developed for administration to combat experienced fighter pilots. A trial administration was conducted using members of the San Antonio Chapter of the Red River Fighter Pilots' Association, and these preliminary findings are presented. Written comments were solicited from these respondents and combined with the preliminary findings. There appear to be indications that while combat per se generates the most severe stress, it is stress experienced prior to combat which is associated with performance. Plans for extended data collection and the usefulness of these data to scientific inquiry, training, and the operational environment are discussed. A copy of the Combat Stress Questionnaire is provided in the appendix. Author (GRA)

N79-13708# National Bureau of Standards, Washington, D. C. Environmental Design Research Div.

HUMAN RESPONSES TO FIRE: THREE DESIGNS FOR RESEARCH Interim Report, Nov. 1977 - Jan. 1978

Fred I. Stahl Mar. 1978 34 p refs

(PB-284959/4; NBSIR-78-1508) Avail: NTIS HC A03/MF A01 CSCL 13L

Three exemplary research design strategies are reported, each aimed at introducing a great degree of rigor into the study of human responses to fires. Both exploratory and experimental designs were considered in various problem contexts. GRA

N79-13709# National Technical Information Service, Springfield, Va.

INFORMATION PROCESSING IN HUMANS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1974 - Nov. 1977

Elizabeth A. Harrison Oct. 1978 212 p

(NTIS/PS-78/1153/2) Copyright. Avail: NTIS HC $28.00/MF $28.00 CSCL 05J

Psychophysiology, memory, visual evoked responses, psychoacoustics, neuroses, decision making and learning, as related to information processing in humans, are the topics covered by the selected abstracts of research reports. This bibliography contains 206 abstracts. GRA

N79-13710# National Technical Information Service, Springfield, Va.

INFORMATION PROCESSING IN HUMANS, VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1977 - Oct. 1978

Elizabeth A. Harrison Oct. 1978 58 p Supersedes NTIS/PS-77/1042; NTIS/PS-76/0947; NTIS/PS-75/858; NTIS/PS-75/087 (NTIS/PS-78/1154/0; NTIS/PS-77/1042; NTIS/PS-76/0947; NTIS/PS-75/858; NTIS/PS-75/087) Copyright. Avail: NTIS HC $28.00/MF $28.00 CSCL 05J

Psychophysiology, memory, visual evoked responses, psychoacoustics, neuroses, decision making and learning, as related to information processing in humans, are topics covered by the selected abstracts of research reports. This updated bibliography contains 53 abstracts, all of which are new entries to the previous edition. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N79-13711*# Webb Associates, Yellow Springs, Ohio.

ANTHROPOMETRIC SOURCE BOOK. VOLUME 2: A HANDBOOK OF ANTHROPOMETRIC DATA

Jul. 1978 428 p refs For Volume 1 see N79-11734

(NASA-RP-1024-Vol-2; S-479-Vol-2) Avail: NTIS HC A19/MF A01 CSCL 05H

Volume 2 contains data resulting from surveys of 61 military and civilian populations of both sexes from the U.S., Europe, and Asia. Some 295 measured variables are defined and illustrated. Author

N79-13712*# Webb Associates, Yellow Springs, Ohio.

ANTHROPOMETRIC SOURCE BOOK. VOLUME 3: ANNOTATED BIBLIOGRAPHY OF ANTHROPOMETRY

Jul. 1978 130 p refs For volume 1 see N79-11734

(NASA-RP-1024-Vol-3; S-479-Vol-3) Avail: NTIS HC A07/MF A01 CSCL 05H

Volume 3 is an annotated bibliography covering a broad

spectrum of topics relevant to applied physical anthropology with emphasis on anthropometry and its applications in sizing and design. Author

N79-13713# Air Force Human Resources Lab., Brooks AFB, Tex.

SURVEY OF HUMAN OPERATOR MODELING TECHNIQUES FOR MEASUREMENT APPLICATIONS Final Report, Apr. 1976 - Dec. 1977

Patricia A. Knoop Jul. 1978 41 p refs
(AF Proj. 6114)
(AD-A058327; AFHRL-TR-78-35) Avail: NTIS HC A03/MF A01 CSCL 05/9

The purpose of this study was to review existing human operator modeling techniques and evaluate their potential utility for performance measurement applications. The major human operator characteristics that ought to be accounted for by a useful model were identified. Then existing models were categorized, surveyed, and summarized. Models in each category were evaluated based on the extent to which they represent the identified human operator characteristics as well as other aspects of their general validity for performance measurement applications. Results are that none of the models implement more than a few of the human operator characteristics; many are based on assumptions which are unacceptable for measurement applications; and others have not been developed far enough to justify their use as a point of departure for measurement. It is concluded that existing models are not sufficiently representative of known characteristics of human behavior to be useful for general applications in performance measurement. Author (GRA)

N79-13714# Pennsylvania Univ., Philadelphia. Dept. of Computer and Information Sciences.

ANALYSIS AND VALIDATION OF HUMAN BIODYNAMIC MODELS Final Report, 1 Dec. 1977 - 30 Jun. 1978

N. Badler 27 Aug. 1978 33 p refs
(Contract N00014-78-C-0102)
(AD-A059013) Avail: NTIS HC A03/MF A01 CSCL 09/2

A cockpit design program, a crash victim simulator, and a new model of a human body to provide a visual facility for examining and evaluating these models has been integrated. This research included transforming the motion simulator output to position the realistic body model, combining the body model and the cockpit data in a shaded graphics display, and detecting collisions between the body and the cockpit. Each of these processes is described and illustrated. Author (GRA)

N79-13715# Florida International Univ., Miami. School of Technology.

HUMAN FACTORS ASPECTS OF LOW LIGHT LEVEL TELEVISION AND FORWARD LOOKING INFRARED SENSOR DISPLAYS. 1: A FEASIBILITY STUDY OF SCALED SUBJECTIVE COMPLEXITY OF STILL SCENES APPLIED TO COMPUTER IMAGE GENERATION Final Report, Feb. 1977 - Jan. 1978

Sybil DeGroot 1 Jan. 1978 90 p refs
(Grant AF-AFOSR-3242-77; AF Proj. 2313)
(AD-A058938; AFOSR-78-1237TR) Avail: NTIS HC A05/MF A01 CSCL 17/5

Initial research was conducted to investigate human responses to still E-O sensor displays so effects of simulated realism could be evaluated. Research objectives included identifying scenes at different levels of scene-complexity and relating major perceptual with physical factors amenable to computer image generation. Nine subjects were psychometrically scaled for scene-complexity photographic sets of Low Light Level Television (L3TV) and Forward Looking Infrared (FLIR) displays of 16 target-areas. After debriefing, subjects matched sensor displays with color photographs. Analysis included tests for significant complexity differences, correlation between scales, and content analyses. Results included synthesized physical measures to quantify sensor displays and contrasting subject responses. Scaling FLIR scenes was reported a different and more difficult task than scaling L3TV displays, however, matching FLIR displays with color photographs was faster with fewer errors, implying FLIR perceptual cues comparable with the graphic detail displayed by L3TV. Findings support a CIG simulation using an optical array of surfaces, edges, and lines with trade-off parameters in the design of a Sensor Simulator determined empirically. Additional evidence indicated that visual parameters of FLIR displays may be more modified by mission assignment and atmospheric variables. Author (GRA)

N79-13716# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

DEVELOPMENT OF THE CWU-46/P HIGH TEMPERATURE RESISTANT ARAMID KNIT FLYER'S COVERALL Interim Report

Jules Z. Lewyckyj and Suzanne M. Reeps 24 Feb. 1978 25 p refs
(AD-A059128; NADC-77290-60) Avail: NTIS HC A02/MF A01 CSCL 06/17

Since 1974, a program has been underway at the NAVAIRDEVCEN to develop an improved high temperature resistant aramid knit flight coverall. A double-knit fabric was used to manufacture two styles of coverall designs which were evaluated by both Navy and Air Force aviators. Based on the results of the evaluation, a redesign effort of both the fabric and the garment were initiated. A warp knit fabric was designed to correct the deficiencies identified during the operational evaluation. The basic garment configuration of one of the double knit styles was retained with specific design improvements as suggested by the test report. Author (GRA)

N79-13717# Ohio State Univ. Research Foundation, Columbus.

A FORMAL MODEL OF THE ADAPTIVE AND DISCRETE CONTROL BEHAVIORS OF HUMAN OPERATORS Final Report, 1 Jun. 1976 - 30 Sep. 1977

Richard A. Miller May 1978 56 p refs
(Grant AF-AFOSR-3003-76)
(AD-A059039; AFOSR-78-1146TR) Avail: NTIS HC A04/MF A01 CSCL 05/8

The focus of manual control research and the methods used for modelling and theorizing about manual control task performance are briefly reviewed. It is concluded that manual control research activities have been overwhelmingly concerned with constructing human operator transfer functions for simple tracking tasks. It is also concluded that the mathematical methods used in this type of research (typically difference or differential equations and their corresponding transfer function representations) constrain rather tightly the type of theories which can result. Further, generalization of these engineering theories beyond tracking is essentially impossible. It is argued, however, that control oriented concepts can be utilized to guide research on human adaptive, supervisory and co-ordinative control activities. A meta-theoretic analysis of control problems is made to identify the types of objects and relations which must be addressed in any theory of manual adaptive control. A new formulation of adaptive control problems is then derived. From the problem description, the type of objects upon which any representation of the adaptor (the system which accomplishes adaptation) are determined. Following in part work by Gaines, the adaptor is defined in terms of behaviors on a sequence of tasks. GRA

N79-13718# Human Engineering Labs., Aberdeen Proving Ground, Md.

A SURVEY OF EXISTING COMPUTER PROGRAMS FOR AIRCREW WORKLOAD ASSESSMENT Final Report

Alan M. Poston May 1978 11 p
(AD-A058518; HEL-TM-13-78) Avail: NTIS HC A02/MF A01 CSCL 09/2

Due to increased concerns of crew workload in tactical nap-of-the-earth environments, increased importance has been placed on the need to utilize a computer simulation to serve as a predictor, or estimator, of crew loading. The US Army Human Engineering Laboratory conducted a survey of existing computer programs which can be used for workload assessment. Each program was assessed in terms of input requirements, processing procedures, outputs available, as well as any other pertinent information. Conclusions are drawn and recommendations are made as to how the Army should approach the problem of obtaining a suitable computer program. Author (GRA)

N79-13719# Futures Group, Glastonbury, Conn.

A TECHNOLOGY ASSESSMENT OF VEGETABLE SUBSTITUTES FOR ANIMAL PROTEIN IN HUMAN FOOD.

VOLUME 1: THE STUDY
H. S. Becker, R. Richmond, E. W. Lusas (Texas A and M Univ., College Station), S. P. Clark (Texas A and M Univ., College Station), and R. O. P. Farrish Mar. 1978 136 p refs 2 Vol. (Contract NSF C-ERS-77-19549)
(PB-284681/4; Rept-352-46-21/01; NSF/RA-780070) Avail: NTIS HC A07/MF A01 CSCL 06H

A detailed technology assessment of vegetable substitutes for animal protein in human food is presented. Vegetable protein is being used in the United States as analogs, ingredients, and extenders of meat and dairy products. Federal legislation will most likely be directed towards the technology and development of new vegetable protein products, rather than influencing consumer purchasing patterns. Several factors are involved in substituting vegetable protein, one of the most important of which is the form the substitution should take. A recommendation is made for a complete technology assessment, which should include all important technological and socio-economic factors.
GRA

N79-13720# Future Systems, Inc., Gaithersburg, Md.
A TECHNOLOGY ASSESSMENT OF VEGETABLE SUBSTITUTES FOR ANIMAL PROTEIN IN HUMAN FOOD. VOLUME 2: APPENDICES
H. S. Becker, R. Richmond, E. W. Lusas (Texas A and M Univ., College Station), S. P. Clark (Texas A and M Univ., College Station), and R. O. P. Farrish Mar. 1978 72 p 2 Vol.
(PB-284682/2; Rept-352-46-21/02; NSF/RA-780071) Avail: NTIS HC A04/MF A01 CSCL 06H

In Appendix A, human physiology and the need for protein is addressed in discussions of metabolism and daily protein requirements and the impact of changes in protein intake. Appendix B includes the results of a mini technology assessment. This assessment of vegetable substitutes for animal protein as human food addresses: (1) factors important to food-consumption patterns; (2) historic food-consumption patterns; (3) important future sources of vegetable protein, including the influence of technology, legislation, and other factors; (4) potential impacts of vegetable substitutes; and (5) potential policy implications.
GRA

N79-13998# Joint Publications Research Service, Arlington, Va.
LIGHT AND COLOR ON A MANNED SPACECRAFT
L. Melnikov and O. Andreyeva *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 65-67 Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 9, 1978 p 32-33 (For primary document see N79-13989 04-99)
Copyright. Avail: NTIS HC A05/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N79-13721 Princeton Univ., N. J.
EFFICIENT COMPUTATION AND DATA STRUCTURES FOR GRAPHICS Ph.D. Thesis
Gregory Michael Hunter 1978 171 p
Avail: Univ. Microfilms Order No. 7823520

Computer automation's problems in manipulating, storing and displaying spatial information are surveyed. A hardware system for compact storage and display of image or other spatial data is presented. Run-length encoding is used. Software made part of the system with the hardware for manipulating these data is described. Algorithms are provided for fast operations on pictures in encoded storage form. The theory of quad tree encodings for representing and operating upon spatial data, activities at the heart of any animation system or other system dealing with spatial data is discussed. New data structures and algorithms that are asymptotically optimal for building quad trees, using these new data structures are presented. Algorithms are used to transform quad tree encodings for pictures into quad trees for the same pictures after application of linear operators.
Dissert. Abstr.

N79-13722 California Univ., Los Angeles.
A METHODOLOGY FOR THE DESIGN OF INTERACTIVE GRAPHICS OPERATING SYSTEMS Ph.D. Thesis
John Robert Barr 1978 449 p
Avail: Univ. Microfilms Order No. 7823374

A new methodology for the design of interactive graphics operating systems based upon the parallel processing characteristics of interactive graphics application programs is defined. In order to verify the defined methodology, an implementation experiment is defined to test the performance of the methodology. A model interactive graphics operating system is specified and implemented. Measurements are defined and recorded during the implementation experiment to determine whether or not the defined methodology aided the implementor in the utilization of display processor hardware functions, the generation of an understandable operating system, or optimizing system performance. The results of the implementation experiment measurements indicate that the defined methodology does improve the efficiency of an implementor by allowing him to utilize display processor hardware functions, generate an understandable interactive graphics operating system, and to improve the performance of application programs.
Dissert. Abstr.

N79-13723# Army Communications Research and Development Command, Fort Monmouth, N. J.
PHASE 2 COMPARATIVE EVALUATION OF THE MCF COMPUTER ARCHITECTURES
S. H. Fuller, G. Mathew, and L. Szewerenko Jul. 1978 53 p refs
(DA Proj. 1L1-62701-AH-92)
(AD-A059196; CORADCOM-78-9-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

Comparing alternative computer architectures is a topic of concern to both users and designers of computer systems. This paper presents the results of a second study undertaken to try and quantitatively evaluate alternative computer architectures. The first study compared the INTERDATA 8/32, PDP11, and IBM 370 architectures. Subsequent interest in additional architectures has allowed us to initiate a second study covering the PDP-11, AN/UYK-20, AN/UYK-19, AN/GYK-12 and AN/UYK-7. This second study has allowed us to address a number of limitations and shortcomings of the first study.
GRA

N79-13724# Naval Surface Weapons Center, White Oak, Md.
A FIXED-POINT ARITHMETIC COMPILER M.S. Thesis. Final Report
Paul Craun, III 1 Jul. 1977 121 p refs
(AD-A059041; NSWC/WOL/TR-77-65) Avail: NTIS HC A06/MF A01 CSCL 09/2

Mini computers used within real time digital systems require mathematical operations to be performed at maximum speed. The most efficient use of their fixed point arithmetic units is made while manipulating fixed point data. Software simulation of floating point mathematics is too slow and requires additional core. A fixed point arithmetic compiler is designed to allow the programmer to express fixed point mathematical processes in equation form. Only the description of the original equation arguments is required. All intermediate results of the equation realization are scaled by the compiler to avoid clipping and truncation errors. Author (GRA)

N79-13725# Rockwell International Corp., Anaheim, Calif. Electronics Research Center.

HIGH DENSITY MAGNETIC BUBBLE MEMORY TECHNIQUES Interim Report, 4 Nov. 1976 - 4 May 1977

P. J. Besser, D. M. Heinz, T. Kobayashi, and T. T. Chen Oct. 1977 51 p refs

(Contract F33615-76-C-1198; AF Proj. 2305)

(AD-A059085; C76-845.15/501; AFAL-TR-77-198) Avail: NTIS HC A04/MF A01 CSCL 09/2

Films of a CaGe - substituted version of the YSmTmIG material have been prepared and characterized. Device structures with 8 micron and 4 micron periods have been fabricated on the Ga- and CaGe - substituted materials. The test results show that the substituted YSmTmIG is an attractive composition for small bubble devices. High quality small bubble films have been grown on 3 in. diameter substrates. An improved process for forming mesas in self-biased films was devised and evaluated. Self-biased wafers were processed with 16 micron period serial shift registers and the devices have been operated at quasistatic frequencies. The analytical results on self-biased structures have been revised using a more exact formulation for the magnetostatic interaction. The feasibility of the period stretching and pattern stitching concepts has been demonstrated. The large capacity chip component test pattern was completed and operation of all components has been verified. A conceptual design of a 10 to the 12th power bit bubble memory system was completed. Author (GRA)

N79-13726# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.

AN EXTENDED MODEL FOR A SYSTEMATIC APPROACH TO THE DESIGN OF COMPLEX SYSTEMS

S. L. Huff and S. E. Madnick Jul. 1978 67 p refs

(Grant N00039-78-G-0160)

(AD-A058565; ISR-P010-7806-07; CISR-TR-7) Avail: NTIS HC A04/MF A01 CSCL 09/2

The objective of this study is to develop a systematic approach to the architectural design of complex software systems. This contract builds on earlier work, in which a graph modelling and decomposition methodology was used to operate upon a set of functional requirements and their interrelationships to generate an architectural design. In this report, certain extensions to the graph model employed to model the requirements are analyzed. Proposed extensions include: (1) implementation nodes; (2) weights on interdependency links; (3) links between implementation nodes; and (4) various types of directed links. The proposed extensions are applied to a small design problem (the design of a 22-requirement database management system) used in earlier work, and found to be implementable - that is, the information that must be supplied by a software designer to establish the model structure in a particular case can be determined in a reasonable length of time. Author (GRA)

N79-13727# Naval Academy, Annapolis, Md.

MICROPROCESSOR-BASED DIGITAL CONTROL OF ENVIRONMENTAL SYSTEMS Final Report, 1977-1978

Eddy D. Kee 1 Jun. 1978 149 p refs

(AD-A058676; USNA-TSPR-92) Avail: NTIS HC A07/MF A01 CSCL 09/2

Recent advances in semiconductor technology have made microprocessor chips and their associated interface and peripheral chips available at low cost and in readily adaptable configurations. The availability of these powerful yet small devices opens up whole new fields of computer control. This project investigated the use of microprocessors and associated hardware to control the heating of a building in order to save energy. A house was simulated on the hybrid computer and controlled by a microprocessor-based digital controller. The microprocessor was a commercially available model, one which could be obtained at low cost and would be accessible to any home owner. By turning the heat off in rooms which were not to be used, a considerable amount of energy could be saved. The program to control the room temperatures would be determined and written on the basis of the probable use of rooms. Tests showed that a significant amount of energy was saved by using the controller, as much as 50%, depending on the use-habits of the house. The house simulation can also be used to study such things as insulation configuration, heater size and location, and room shapes and sizes with respect to the amount of energy saved. GRA

N79-13728# Stanford Univ., Calif. Electronics Labs.

NOTES ON MODELLING OF COMPUTER SYSTEMS AND NETWORKS

Philip S. Yu Apr. 1978 49 p refs

(Contract DASG60-77-C-0073)

(AD-A058347; SU-SEL-78-016; DSL-TR-154) Avail: NTIS HC A03/MF A01 CSCL 09/2

Formulation of given computer system or network problems into abstract stochastic models is considered. Generally speaking, model formulation is an art. While analytic results are clearly not powerful enough to provide a cookbook approach to modelling, general methodology and difficulties on model formulation are discussed through examinations of various computer system and network models. These models are presented in a systematic way based on the hierarchical approach. Author (GRA)

N79-13729# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

SIMPL-M CODE GENERATION FOR THE INTEL 8080 MICROCOMPUTER M.S. Thesis - Virginia Univ.

James B. Bladen 23 Nov. 1977 91 p refs

(AD-A058434; AFIT-CI-78-65) Avail: NTIS HC A05/MF A01 CSCL 09/2

Microcomputers add a new dimension to modern computers. However, since microcomputers are not well-suited to running large compilers, the medium of communication between the programmer and micros has traditionally been assembly language. The computer software industry realized some time ago that the most effective means of generating a software system is by using a compiler capable of communicating clearly both with the programmer and the computer hardware. Such compilers are necessarily large, and are generally used to create machine code for the big machines they run on. However, by replacing a compiler's code generator with the code generator of a small machine, a compiler can run on the large machine and generate code for a small one, and the size limitation problem is eliminated. This thesis presents just such a cross-compiler. The large machine is the CDC 6000 and the very capable compiler is the SIMPL compiler written by Victor R. Basili and Albert J. Turner. GRA

N79-13730# Cornell Univ., Ithaca, N. Y. Dept. of Computer Science.

PARALLELISM IN RANDOM ACCESS MACHINES

Steve Fortune and James Wyllie Jan. 1978 20 p refs

(Contract N00014-76-C-0018)

(AD-A058427; CU-CSD-TR-78-334) Avail: NTIS HC A02/MF A01 CSCL 09/2

A model of computation based on random access machines operating in parallel and sharing a common memory is presented. The computational power of this model is related to that of traditional models. In particular, deterministic parallel RAM's can accept in polynomial time exactly the sets accepted by polynomial tape bounded Turing machines; nondeterministic RAM's can accept in polynomial time exactly the sets accepted by nondeterministic exponential time bounded Turing machines. Similar results hold for other classes. The effect of limiting the size of the common memory is also considered. Author (GRA)

N79-13731# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Sciences.

RELIABILITY AND PERFORMANCE MODELS FOR ERROR CORRECTING MEMORY AND REGISTER ARRAYS Interim Report

Steven A. Elkind and Daniel P. Siewiorek 22 May 1978 46 p refs

(Contract N00014-77-C-0103)
(AD-A058742; CMU-CS-78-118) Avail: NTIS HC A03/MF A01 CSCL 09/2

Current digital system design practices make heavy utilization of various types of memories. RAMS and ROMS are used in main memory, register files, caches, and microstores. As a result, it becomes important to recognize the implications of memory chip failure modes for system reliability. A brief survey of available memory chip failure mode data is made and shows that partial chip failures are more prevalent than whole chip failures. Based on the findings of this survey, reliability models for memory systems with error coding techniques are developed. The effect of memory support circuitry on memory reliability, usually ignored in the development of analytical models, is included. It is shown that for wide ranges of memory system parameters and memory element failure rates the memory system reliability is dominated by the effect of the support electronics. The use of these models in design tradeoff decisions is explored. The performance of systems with fault tolerant memory when there are correctable failures present, an area which has seen little work, is analyzed. Performance models for systems with fault tolerant main memory, as well as those with fault tolerant microstore, are developed and their properties explored. GRA

N79-13732# National Technical Information Service, Springfield, Va.
COMPUTER PERFORMANCE EVALUATION. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1970 - Aug. 1978
George W. Reimherr Oct. 1978 194 p Supersedes NTIS/PS-77/0938; NTIS/PS-76/0830; NTIS/PS-75/753; NTIS/PS-75/063 (NTIS/PS-78/1078/1; NTIS/PS-77/0938; NTIS/PS-76/0830; NTIS/PS-75/753; NTIS/PS-75/063) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

The bibliography cites research on the measurement of computer sytems effectiveness. It includes studies on workload determination, computational efficiency, and techniques for performance evaluation of both hardware and software. This updated bibliography contains 189 abstracts, 26 of which are new entries to the previous edition. GRA

N79-13733# National Technical Information Service, Springfield, Va.
COMPUTER STORAGE MANAGEMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jul. 1978
George W. Reimherr Aug. 1978 212 p Supersedes NTIS/PS-77/0775; NTIS/PS-76/0669; NTIS/PS-75/528; NTIS/PS-74/095
(NTIS/PS-78/0803/3; NTIS/PS-77/0775; NTIS/PS-76/0669; NTIS/PS-75/528; NTIS/PS-74/095) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

The cited reports cover dynamic storage allocation, paging, interleaved memory, and virtual memory. Also included are the necessary programs, compilers, and algorithms for implementation in various computer systems. This updated bibliography contains 205 abstracts, 16 of which are new entries to the previous edition. GRA

N79-13990# Joint Publications Research Service, Arlington, Va.
SOVIET COMPUTERS DESCRIBED
In its Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 7-10 Transl. into ENGLISH from Ikonomicheski Zhivot (Bulgaria), 30 Aug. 1978 7 p (For primary document see N79-13989 04-99)
Copyright. Avail: NTIS HC A05/MF A01

N79-13991# Joint Publications Research Service, Arlington, Va.
IMPROVED COMPUTER TECHNIQUES PROPOSED FOR INDUSTRY
Antoliy Andreyevich Modin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol.,No. 54 (JPRS-72282) 22 Nov. 1978 p 11-15 Transl. into ENGLISH from Ekon. Mat. Metody (Moscow), no. 5, Sep./Oct. 1978 p 835-844 (For primary document see N79-13989 04-99)
Copyright. Avail: NTIS HC A05/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N79-13734 Utah State Univ., Logan.
A SYSTEM FOR REAL TIME SOFTWARE DATA FAULT TOLERANCE Ph.D. Thesis
John Gee Yee 1978 162 p
Avail: Univ. Microfilms Order No. 7821164

A hardware supported, software error detection system is introduced. Properties of the graph theory are utilized for detecting control errors by using two-dimensional storage hardware. The proposed system utilizes matrix parameter comparison. Boolean matrix multiplication, watchdog timer, and hardware trap for detecting software errors such as wrong transfer control flow, external infinite loops, internal infinite loops, parameter specifications, and interaction errors. In recovery, estimated data is based on means, variances, correlation coefficients, and current values of all variables. Using reasonable assumptions, the probability model of the proposed system is evaluated. It is shown that the proposed system increases the overall reliability. Finally, because of the block structure, a roll-back system which tolerates hardware intermittent faults can be modified to the proposed system with few changes. Dissert. Abstr.

N79-13735*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REFERENCE MANUAL FOR THE LANGLEY RESEARCH CENTER FLIGHT SIMULATION COMPUTING SYSTEM
Jeff I Cleveland, II, Daniel J. Crawford, and Lawrence F. Rowell Jul. 1978 103 p refs Revised
(NASA-TM-78757) Avail: NTIS HC A06/MF A01 CSCL 09B

The researchers at the Langley Research Center Flight Simulation Computing System are provided with an advanced real-time digital simulation capability. This capability is controlled at the user interface level by the Real Time Simulation Supervisor. The Supervisor is a group of subprograms loaded with a simulation application program. The Supervisor provides the interface between the application program and the operating system, and coordinates input and output to and from the simulation hardware. The Supervisor also performs various utility functions as required by a simulation application program. S.E.S.

N79-13736*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TOOLS FOR EMBEDDED COMPUTING SYSTEMS SOFTWARE
1978 137 p refs Workshop held at Hampton, Va., 7-8 Nov. 1978; sponsored in part by AIAA
(NASA-CP-2064; L-12640) Avail: NTIS HC A07/MF A01 CSCL 09B

A workshop was held to assess the state of tools for embedded systems software and to determine directions for tool development. A synopsis of the talk and the key figures of each workshop presentation, together with chairmen summaries, are presented. The presentations covered four major areas: (1) tools and the software environment (development and testing); (2) tools and software requirements, design, and specification; (3) tools and language processors; and (4) tools and verification and validation (analysis and testing). The utility and contribution of existing tools and research results for the development and testing of embedded computing systems software are described and assessed. B.B.

N79-13737# California Univ., Santa Cruz. Information Sciences.
LOGIC PROGRAMMING APPLIED TO NUMERICAL INTEGRATION
Keith Clark, W. M. McKeeman, and Sharon Sickel 1 Aug. 1978 27 p refs
(Contract N00014-76-C-0682)
(AD-A058581; TR-78-8-004) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper uses logic programming to describe numerical integration in a general way. Axioms are added to the basic logic programs to define specific known numerical integration

algorithms. Using a slightly different formalization, we construct logic programs for adaptive Romberg integration and for a new algorithm for adaptive integration. The logic programs provide a formal basis for classifying numerical quadrature algorithms (recall Rice's comment that there are 1,000,000 useful ones). The logic programs are also more understandable than the corresponding programs in conventional programming languages. In terms of logic programming there are several novel points in this paper. The data type, real number, is not defined by a recursive constructor function. Termination is decided by error bounds, rather than by reaching some basis case of the data constructor. The problem itself seems to demand concurrent execution and global variables but in fact is solved in a linear fashion.

Author (GRA)

N79-13738# California Univ., Santa Cruz. Information Sciences.

INVERTIBILITY OF LOGIC PROGRAMS

Sharon Sickel 1 Aug. 1978 22 p refs

(Contract N00014-76-C-0682)

(AD-A058582; TR-78-8-005) Avail: NTIS HC A02/MF A01 CSCL 09/2

Predicates can describe functions; the arguments of the predicates are the input and output parameters of the function. Logic programs describe relationships between objects rather than merely sequential instructions, and it is common for both a function and its inverse to be computable by the same logic program. Given values for some subset of the arguments to a function-describing predicate, one may be able to decide, in general, which of the remaining arguments are computable by the logic program. The concept of functional inverse can be generalized in the context of logic programming. A new kind of inverse, called j-inverse, is defined. Two algorithms which analyze and test the recursive structure of logic programs for any specific invertibility are presented. A set of guidelines to help the logic programmer construct j-invertible programs is given. GRA

N79-13739# Naval Ship Engineering Center, Philadelphia, Pa.

SYSTEM IDENTIFICATION BY REDUCED MULTIPLE QUADRATURE Final Report

J. R. Garnett 21 Jul. 1978 256 p refs

(SF34333302)

(AD-A059125; NAVSECPHILAD-C-54) Avail: NTIS HC A12/MF A01 CSCL 09/2

This report introduces the mathematical development and application of a method for identifying system transfer functions from input-ouput data. Discussion covers: (1) Mathematical development of the method; (2) Application of method for analytical examples; (3) Application of method to numerical examples; (4) Noise consideration; and (5) Extension of method to systems having transport delay, to multivariable systems and to a class of non-linear systems. GRA

N79-13740# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.

SPARSE SYMMETRIC MATRIX PROCESSING Interim Report

Paul S. Jensen and John K. Reid 26 May 1978 96 p refs

(Contract F49620-76-C-0003; AF Proj. 2304)

(AD-A059048; LMSC-D626184; AFOSR-78-1149TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

This document is an extensive report describing a new sparse matrix processing system for very large symmetric matrices. It includes a description of a virtual memory system used in support of the system, and results from comparison tests with a profile matrix processor on problems arising from finite-element analyses of structures. GRA

N79-13741# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

ALGORITHMS FOR REPORTING AND COUNTING GEOMETRIC INTERSECTIONS Interim Report

Jon L. Bentley and Th. Ottmann Aug. 1978 20 p refs

(Contract N00014-76-C-0370)

(AD-A058768; CMU-CS-78-135) Avail: NTIS HC A02/MF A01 CSCL 12/1

An interesting class of Geometric Intersection Problems calls for dealing with the pairwise intersections among a set of N objects in the plane. These problems arise in many applications such as printed circuit design, architectural data bases, and computer graphics. Shamos and Hoey have described a number of algorithms for detecting if any two objects in a planar set intersect. This paper extends this work by giving algorithms which count the number of such intersections and algorithms which report all such intersections. GRA

N79-13742# Dayton Univ., Ohio. Research Inst.

PLOTTING LANGUAGE UTILIZING GRAPHICAL OPTICS (PLUGO). VOLUME 1: USER'S GUIDE Final Report, Nov. 1977 - Feb. 1978

Jerry G. Jensen Wright-Patterson AFB, Ohio AFFDL May 1978 124 p refs 2 Vol.

(Contract F33615-76-C-3076; AF Proj. 2404)

(AD-A058986; UDR-TR-78-32-Vol-1; AFFDL-TR-78-55-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report describes the function and use of a system of digital computer programs called PLUGO (Plotting Language Utilizing Graphical Optics). PLUGO combines batch processing with interactive graphics to provide the engineer with an analysis tool capable of handling large quantities of data. Basic input consists of a sequential file containing any number of fixed format data records. Data records contain values for up to 100 experimental variables. Output consists of X-Y plots of user specified data subsets from the input data file. Plots are subject to inspection, editing, curve-fitting, and interpolation via an interactive graphics program. A special function creates trimmed plots of wind-tunnel generated force-moment data. Programs are written in CDC FORTRAN EXTENDED for execution on a CDC 6600 or CYBER 74 computer system. Author (GRA)

N79-13743# Dayton Univ., Ohio. Research Inst.

PLOTTING LANGUAGE UTILIZING GRAPHICAL OPTICS (PLUGO). VOLUME 2: PLUGO SYSTEMS DESCRIPTION Final Report, Nov. 1977 - Feb. 1978

Jerry G. Jensen Wright-Patterson AFB, Ohio AFFDL May 1978 576 p refs 2 Vol.

(Contract F33615-76-C-3076; AF Proj. 2404)

(AD-A058673; UDR-TR-78-34-Vol-2; AFFDL-TR-78-55-Vol-2) Avail: NTIS HC A24/MF A01 CSCL 09/2

For abstract, see N79-13742.

N79-13744# Purdue Univ., Lafayette, Ind. School of Engineering.

A PATTERN DEFORMATIONAL MODEL AND BAYES ERROR-CORRECTING RECOGNITION SYSTEM Interim Report

W. H. Sai and K. S. Fu May 1978 45 p refs

(Grant AF-AFOSR-2661-74; MDA903-77-G-1)

(AD-A058791; TR-EE78-26; AFOSR-78-1297TR) Avail: NTIS HC A03/MF A01 CSCL 09/4

Various types of pattern deformations are investigated from the syntactic point of view and categorized into two major types: local deformations and structural deformations. Random noise, distortion variations, and substitutions, of pattern primitives belong to the former; syntactic errors due to pattern structural changes, such as primitive deletions and insertions, belong to the latter. Every observed pattern can be regarded as transformed from a pure pattern through these two types of deformations. An error-correcting parsing scheme for local deformations optimum in the Bayes sense is proposed. Two structure-preserved error-correcting parsers, one for string languages, the other tree languages, are also presented. Finally, further researches concerning error-correcting parsings for structural deformations

and a complete error-correcting systems for both kinds of deformations are suggested. GRA

N79-13745# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.
THE INTERACTIVE IMAGE DISPLAY SYSTEM Final Report, Sep. 1974 - Jan. 1978
Mel Hass and Mary Beth Marquardt Jul. 1978 42 p
(sr0140301)
(AD-A058830; DTNSRDC/CMLD-78/07) Avail: NTIS HC A03/MF A01 CSCL 09/2

IMAGE is a high-performance interactive computer graphics program for displaying 2-D graphs and perspective projections of 3-D data. The development of IMAGE was prompted by the need for a tool for solving numerical fluid dynamics problems, but it was designed to be general enough for use in graphically representing input and output data in any problem area. The IMAGE input data to be examined may be produced by any FORTRAN program with simple WRITE statements. The data can then be displayed, studied, manipulated, and modified by the user. Publication quality hardcopy output of selected views is easily and quickly obtained from the CALCOMP or SC 4060 plotters. IMAGE is designed to run quickly and efficiently. Speed is attained by minimizing the number of requests required to perform a function. Efficiency results from programming each transaction as a separate module, called a task. These tasks are loaded into core memory only as needed. Virtual memory techniques also save core storage. The program is available for general use on the Tektronix 4014 and the CDC IGS 274 terminals linked to the DTNSRDC CDC 6700 and 6400 computers.
Author (GRA)

N79-13746# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
AN INFORMAL DEFINITION OF ALPHARD (PRELIMINARY) Interim Report
William A. Wulf, Paul Hilfinger, Robert Fitzgerald, Izumi Kimura, and Ralph L. London Feb. 1978 58 p
(Contracts F44620-73-C-0074; DAHC15-72-C-0308)
(AD-A058871; CMU-CS-105) Avail: NTIS HC A04/MF A01 CSCL 09/2

The Alphard language design has four major goals: (1) to support modern programming methodology, (2) to permit practical program verification, (3) to permit extremely efficient object code to be produced, and (4) to permit the programmer to control certain implementation decisions -- such as the representation of data structures. Previous Alphard papers have explored aspects of these issues as they relate to particular language features; to facilitate these explorations these papers used a different syntax for the language. The present report is a complete informal definition of Alphard that both simplifies and unifies the language. Author (GRA)

N79-13747# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
FORMALIZATION AND AUTOMATIC DERIVATION OF CODE GENERATORS Interim Report
R. G. G. Cattell Apr. 1978 133 p refs
(Contract F44620-73-C-0074)
(AD-A058872; CMU-CS-78-115; AFOSR-78-1248TR) Avail: NTIS HC A07/MF A01 CSCL 09/2

This work is concerned with automatic derivation of code generators, which translate a parse-tree-like representation of programs into sequences of instructions for a computer defined by a machine description. In pursuing this goal, the following are presented: (1) a model of machines and a notation for their description; (2) a model of code generation, and its use in optimizing compilers; and (3) an axiom system of tree equivalences, and an algorithm for derivation of translators based on tree transformations (this is the main work of the thesis). The algorithms and representations are implemented to demonstrate their practicality as a means for generation of code generators.
Author (GRA)

N79-13748# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
REPRESENTATION OF THREE-DIMENSIONAL OBJECTS Interim Report
D. R. Reddy and S. Rubin Apr. 1978 20 p refs
(Contract F44620-73-C-0074; AF Proj. 2466)
(AD-A058894; CMU-CS-78-113; AFOSR-78-1245TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper describes a system for generation and representation of computer models of arbitrary three dimensional objects. Three representations are explored which have varying time and space tradeoffs. These representations, which are tailored for irregular 3-D objects, store every input point exactly by using a tree structuring of the object space. Their advantage over more common representations is that they make perspective and hidden-surface elimination less difficult. In addition, one of the representations simplifies the storage of dynamic objects and objects with redundant sub-parts. Author (GRA)

N79-13749# Arinc Research Corp., Annapolis, Md.
ENHANCEMENT OF COMPUTER PROGRAM EAGLE. VOLUME 2: EAGLE PROGRAM LISTING
P. J. Orth May 1978 242 p
(Contract F33657-77-D-0029)
(AD-A058350; Rept-1982-01-1-1756-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 09/2

This report documents a project to enhance the capabilities of the on-line (interactive) computer program EAGLE, and the development of three new computer programs, QUICK, PURGNOW, and EST1000. EAGLE enables calculation of acquisition costs for any type of system, and can readily be used to perform a broad range of other types of calculations. This report on EAGLE enhancement is Enhancement of Computer Program EAGLE: EAGLE Program Listing. GRA

N79-13750# Arinc Research Corp., Annapolis, Md.
ENHANCEMENT OF COMPUTER PROGRAM EAGLE. VOLUME 3: QUICK PROGRAM LISTING
P. J. Orth May 1978 240 p
(Contract F33657-77-D-0029)
(AD-A058352; Rept-1982-01-1-1756-Vol-3) Avail: NTIS HC A11/MF A01 CSCL 09/2

This report documents a project to enhance the capabilities of the on-line (interactive) computer program EAGLE, and the development of three new computer programs, QUICK, PURGNOW, and EST1000. EAGLE enables calculation of acquisition costs for any type of system, and can readily be used to perform a broad range of other types of calculations. This report on EAGLE enhancement is Enhancement of Computer Program EAGLE: QUICK Program Listing. GRA

N79-13751# TRW Defense and Space Systems Group, Redondo Beach, Calif.
AIRBORNE SYSTEMS SOFTWARE ACQUISITION ENGINEERING GUIDEBOOK FOR QUALITY ASSURANCE Final Report
M. Lipow Nov. 1977 112 p refs
(Contract F33657-76-C-0677; AF Proj. 2238)
(AD-A059068; TRW-30323-6005-TU-00; ASD-TR-78-8) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report is one of a series of guidebooks which provide guidance for ASD and SAMSO Program Office and engineering personnel in the acquisition management and engineering of Airborne Systems software procured under Air Force 800 series regulations. It provides information that will help personnel plan, specify, and monitor quality assurance activities in connection with the acquisition of Computer Program Configuration Items (CPCIs) for Airborne Systems. Author (GRA)

N79-13752# California Univ., Santa Cruz. Information Sciences.
AXIOMATIC SPECIFICATION OF SYNTAX-DIRECTED TRANSLATION
Sharon Sickel and W. M. McKeeman 1 Aug. 1978 20 p refs
(Contract N00014-76-C-0682)
(AD-A058574; TR-78-8-002) Avail: NTIS HC A02/MF A01 CSCL 09/2

Predicate logic is applied to the specification of syntax-directed translation. Context-free grammars are shown to be representable by logic programs, and a translation from grammars to logic programs is presented as a logic program. Coupled grammars

are introduced, shown to be interpretable as translators, shown to be representable as logic programs, and translation from coupled grammars to logic programs is presented via logic programs. Mixed grammars, a concisely representable special case of coupled grammars, are given in terms of coupled grammars.
Author (GRA)

N79-13753# California Univ., Santa Cruz.
REMOVING REDUNDANT RECURSION
Sharon Sickel 1 Aug. 1978 33 p
(Contract N00014-76-C-0682)
(AD-A058580; TR-78-8-003) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper presents an algorithm that rewrites into efficient form some recursive functions that contain redundant calls (e.g. the Fibonacci function). This paper generalizes one method and eliminates the need for the user intervention. Formal definitions are given for the optimization of functions for both linear and multi-dimensional data types. The algorithm depends upon the arguments of the recursive function being defined by a structural induction, and defines a measure of distance on arguments that determines when and how the rewrite can be carried out. This paper is not concerned with the implementation issues arising from the relative efficiency of recursive and iterative mechanisms in programming languages, but rather with restructuring the algorithms themselves. GRA

N79-13754# Stanford Univ., Calif. Dept. of Computer Science.
NATURAL LANGUAGE PROCESSING IN AN AUTOMATIC PROGRAMMING DOMAIN Ph.D. Thesis
Jerrold M. Ginsparg Jun. 1978 173 p refs
(Contract MDA903-76-C-0206; ARPA Order 2494)
(AD-A058531; STAN-CS-78-671; AIM-316) Avail: NTIS HC A08/MF A01 CSCL 09/2

This paper is about communicating with computers in English. In particular, it describes an interface system which allows a human user to communicate with an automatic programming system in an English dialogue. The interface consists of two parts. The first is a parser called Reader. Reader was designed to facilitate writing English grammars which are nearly deterministic in that they consider a very small number of parse paths during the processing of a sentence. This efficiency is primarily derived from using a single parse structure to represent more than one syntactic interpretation of the input sentence. The second part of the interface is an interpreter which represents Reader's output in a form that can be used by a computer program without linguistic knowledge. The Interpreter is responsible for asking questions of the user, processing the user's replies, building a representation of the program the user's replies describe, and supplying the parser with any of the contextual information or general knowledge it needs while parsing. Author (GRA)

N79-13755# National Bureau of Standards, Washington, D. C. Computer Systems Engineering Div.
COMPUTER SCIENCE AND TECHNOLOGY: COMMON COMMAND LANGUAGE FOR FILE MANIPULATION AND NETWORK JOB EXECUTION. AN EXAMPLE
M. L. Fitzgerals Aug. 1978 37 p refs
(PB-284459/5; NBS-SP-500-37) Avail: NTIS HC A03/MF A01 CSCL 09B

Computer networks provide the capability for sharing resources across many diverse computer systems. This capability is used to help the user become familiar with all the varied command languages and protocols of each accessed system. A general approach is presented to solving this problem using an intermediary system to support a set of common commands for file manipulation and network job execution. The feasibility of this approach is shown, and common commands are implemented for four systems using the NBS Network Access Machine. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N79-13756 Maryland Univ., College Park.
THE STORAGE LIMITED EXPONENTIAL QUEUE AND APPLICATIONS TO FINITE MEMORY SIZE MODELS OF COMPUTER SYSTEMS Ph.D. Thesis
Raymond Morris Bryant 1978 232 p
Avail: Univ. Microfilms Order No. 7823988

The class of storage limited exponential queues is defined and proposed as a basis for finite memory size models of computer systems. A storage limited exponential queue (or SL-M/M-type queue) is a generalization of the well known M/M-type queue in which each customer is assigned a memory size in addition to a service requirement. The storage allocation process under infinite workload (i.e., saturation) conditions, properties of the distribution of the number of customers present in storage (the multiprogramming level or MPL) are derived for the loading policy FCFL. Dissert. Abstr.

N79-13757 Stanford Univ., Calif.
PERFORMANCE CONSIDERATIONS FOR THE RELIABILITY ANALYSIS OF COMPUTING SYSTEMS Ph.D. Thesis
Marie Danielle Beaudry 1978 165 p
Avail: Univ. Microfilms Order No. 7822477

Reliability analysis techniques which account for various aspects of the computing environment, e.g., the workload of the system and its throughput are developed. The principal results are: (1) the development of appropriate measures to determine the effect of failures on overall system performance, (2) a technique to model the effects of system workload characteristics on the overall system reliability, and (3) a statistical analysis of the Stanford Linear Accelerator Center Triplex multiprocessor. The analysis is aimed at gracefully degrading (also called fail-softly) computing systems. The computation capacity of a system state as the amount of usable computation available in that state is defined. Performance parameters such as throughput are used to evaluate the computation capacity which is used in turn to determine various performance-related reliability measures for computing systems. Dissert. Abstr.

N79-13758 California Univ., Davis.
COMPUTER AIDED DESIGN OF MICROPROCESSOR-BASED CONTROLLERS Ph.D. Thesis
Alan Albert Ross 1978 278 p
Avail: Univ. Microfilms Order No. 7822670

A demonstration of the feasibility of automatically designing microprocessor-based system is described. The algorithm maps realization-independent problem descriptions into a library of realizations of portions of the system, automatically combining these portions to generate the complete system. The feasibility demonstration was limited to the generation of real-time controllers, for which the algorithm develops a monitor strategy which guarantees that the real-time constraints will be met. Important features of the algorithm include a heuristic for the generation of non-preemptive schedules with guaranteed response and a description of an approach to preemptive (interrupt driven) scheduling with guaranteed response. Dissert. Abstr.

N79-13759 Minnesota Univ., Minneapolis.
GENERATION OF SYMBOLIC NETWORK FUNCTIONS AND STATISTICAL VARIABILITY MEASURES Ph.D. Thesis
Maw-Kuei Tsai 1978 213 p
Avail: Univ. Microfilms Order No. 7823968

An approach to the problem of generating network functions in a symbolic form by means of a digital computer was proposed and investigated. A novel form of a two-dimensional array was used to represent a polynomial in a strictly symbolic form and certain rules for addition and multiplication of the arrays were established. The special binary properties of the modern computer to carry these mathematical operations in a very efficient manner were used. Techniques such as bias packing and dynamic dimension, simple linkage of blocks of words to save computer memory were explained. Significant reduction in computer time was possible by applying above techniques and properties. The details of reducing the indefinite admittance matrix of given network to a 2x2 matrix by pivotal condensation in successive stages were given. Though network is commonly limited to network containing only voltage controlled current sources, besides the passive elements, certain modifications were proposed in

this matrix description such that the remaining three types of controlled sources viz., voltage controlled voltage sources, current controlled current sources and current controlled voltage sources, might be included in the networks that could be analyzed by the above method. Dissert. Abstr.

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N79-13760 California Univ., Santa Barbara.
A FREQUENCY DOMAIN ADAPTIVE CONTROLLER Ph.D. Thesis
Sandra L. Harris 1978 193 p
Avail: Univ. Microfilms Order No. 7824179

A frequency domain adaptive controller for application to the class of systems which includes single-input/single-output linearizable deterministic processes in standard feedback loops was developed, tested, and evaluated. The algorithm modifies the controller parameters to match the shape of a desired closed-loop transfer functions as index of performance. A nonparameteric frequency domain identification is followed by a simple optimization to determine new controller parameters and a time scale factor. The technique does not require the control loop to be physically opened. Dissert. Abstr.

N79-13761 Missouri Univ. -Rolla.
ADAPTIVE CONTROL OF A CLOUD SIMULATION CHAMBER EXPANSION SYSTEM Ph.D. Thesis
Katiya Greigarn 1978 88 p
Avail: Univ. Microfilms Order No. 7822371

The design and construction of a closed-loop computer controlled expansion system for a cloud simulation chamber is described. The chamber is used to simulate atmospheric phenomena for the study of microphysical processes. In order to accomplish this, the sample gas inside the chamber must be expanded adiabatically. This means the wall temperature and the gas temperature must be made to agree as closely as possible. The wall is cooled by thermoelectric modules, and the temperature is controlled by analog controllers. The gas is cooled by the adiabatic expansion, and the corresponding pressure is controlled by a laboratory minicomputer, a NOVA 840. Dissert. Abstr.

N79-13762 Wisconsin Univ. - Madison.
SENSITIVITY ANALYSIS AND SYNTHESIS IN AUTOMATIC CONTROL SYSTEMS Ph.D. Thesis
Mansour Eslami 1978 459 p
Avail: Univ. Microfilms Order No. 7815406

The time-domain sensitivity analysis and synthesis in automatic control is presented. A general theory is discussed for the rational analysis of the sensitivity of linear systems: primarily emphasizing, in the early part of the thesis, small sensitivity analysis. The standing of invariance theory is reviewed, with further discussion on the so-called sensitivity in the large, and some sensitivity invariants for linear systems are developed. New synthesis algorithms for minimization of several sensitivity measures are developed. These algorithms, provide synthesis procedures for designing ultrareliable systems. A general theory for deriving the optimal input for system identification versus system sensitivity reduction, with plant-operator is described. Several new problems and extensions are presented; two appendices setting out detailed numerical examples pertinent to the theory and results developed herein and the corresponding list of computer programs. Dissert. Abstr.

N79-13763 Wisconsin Univ. - Madison.
VARIANCE REDUCTION TECHNIQUES FOR SIMULATED QUEUING PROCESSES Ph.D. Thesis
John Sears Carson, II 1978 119 p
Avail: Univ. Microfilms Order No. 7815400

Two related variance reduction techniques for the estimation of steady-state parameters of regenerative queuing systems are presented. The stable regenerative GI/G/s queue, is proved more efficient to estimate the time average number of customers in queue, Q, indirectly by multiplying the standard regenerative estimator of mean delay in queue, d, by the known arrival rate, than to estimate Q by its standard regenerative estimator. This technique, known as indirect estimation is extended to the estimation of mean wait in system, w, time average number in system, L, and time average amount of work in system, V, for regenerative GI/G/s queue. Dissert. Abstr.

N79-13764 Minnesota Univ., Minneapolis.
THE DEVELOPMENT OF COMPUTATIONAL PROCEDURES FOR A SPECIAL CLASS OF STOCHASTIC CONTROL SYSTEMS Ph.D. Thesis
Richard Val Houska 1978 151 p
Avail: Univ. Microfilms Order No. 7823922

Several new computational procedures that solve practical control problems are developed and evaluated. The development of the procedures is based on a novel approach that emphasizes certain structural aspects of the corresponding stochastic control models. The main results are of both a theoretical and applied nature. Included in the theory is a new derivation of an optimal control for a special type of controlled Markov process. The applied results include algorithms which produce optimal and approximately-optimal controls as well as approximations for control related problems. Most of the algorithms and other computational procedures are evaluated and tested using computer program implementations with representative input data. Structured FORTRAN 4 source listings are provided for the computer program implementations. Dissert. Abstr.

N79-13765 Purdue Univ., Lafayette, Ind.
IMAGE SEGMENTATION BY UNSUPERVISED CLUSTERING AND ITS APPLICATIONS Ph.D. Thesis
John Raymond Yoo 1978 168 p
Avail: Univ. Microfilms Order No. 7821526

A new image segmentation algorithm is developed as a preprocessor for image processing tasks such as the detection of interesting objects, pattern recognition and image enhancement. This segmentation algorithm is based on the fundamental assumption that reasonably well-defined separable segments of an image may be represented by well-clustered modes in the distribution of suitable chosen features extracted from the image. The algorithm consists of three major steps: feature extraction, unsupervised feature clustering and the backward transform from the feature space to the image space. Some comparisons are made between the developed segmentation algorithm and other image segmentation techniques based on supervised feature clustering or statistical hypothesis tests. The following practical applications are investigated: the detection of airports by the separation of their runways from the terrestrial backgrounds, the recognition of airplanes via Fourier shape descriptors and the enhancement of archeological images for which no conventional image enhancement technique can be applied. Dissert. Abstr.

N79-13766 Purdue Univ., Lafayette, Ind.
STATISTICAL PATTERN RECOGNITION USING CONTEXTUAL INFORMATION Ph.D. Thesis
Tai Sen Yu 1978 221 p
Avail: Univ. Microfilms Order No. 7821528

A stationary stochastic process on a two-dimensional plane is developed. This process is then used as a model such that correlations between any pair of image cells can be extracted. The model is characterized by a spatial correlation parameter. A very flexible coding technique is presented by which the spatial correlation parameter can be estimated. From the coding pattern used for estimating the spatial correlation parameter, a recursive contextual classification procedure is proposed. The advantage of a recursive classification algorithm is that the developed model can be fitted by the image data more appropriately. Finally, extensive experimental results with remotely sensed multispectral scanner data using developed model for contextual classification are reported. Both single-stage and recursive contextual classification procedures are tested on real data. The classification results do show the effectiveness and efficiency of the developed contextual classifier. Dissert. Abstr.

N79-13767# Colorado Univ., Boulder. Dept. of Electrical Engineering.
DESIGN OF FEEDBACK SYSTEMS WITH NONMINIMUM-

PHASE UNSTABLE PLANTS Interim Report
Isaac M. Horowitz Jul. 1978 28 p refs
(Grant AF-AFOSR-2946-76; AF Proj. 2304)
(AD-A058964; AFOSR-78-1270TR) Avail: NTIS HC A03/MF A01 CSCL 09/3

Feedback systems with right half-plane poles and zeros may have inherently very poor sensitivity properties. In the design procedure presented, the closed-loop poles are restricted to two possible regions in the complex plane. One region is Re s < or = -sigma, sigma > 0. A second is the interior and boundary of a circle in the left half-plane. The design is optimum in the sense of maximizing the gain factor uncertainty, for which the restriction is satisfied. The design procedure is very simple to execute and results in loop transmission poles and zeros which are symmetrical with respect to the boundary of the forbidden region. The closed-loop poles lie entirely on the boundary, over the range of gain uncertainty. Author (GRA)

N79-13768# Delaware Univ., Newark. Dept. of Statistics and Computer Science.
EFFICIENT ALGORITHMIC SOLUTIONS TO EXPONENTIAL TANDEM QUEUES WITH BLOCKING Interim Report
Guy Latouche and Marcel F. Neuts Jun. 1978 33 p refs
(Grant AF-AFOSR-3236-77; AF Proj. 2304)
(AD-A058884; TR-78-12) Avail: NTIS HC A03/MF A01 CSCL 12/1

Stable queueing systems consisting of two groups of servers, having exponential service times, placed in tandem and separated by a finite buffer, are shown to have a steady-state probability vector of matrix-geometric form. The queue is stable as long as the Poisson arrival rate does not exceed a critical value, which depends in a complicated manner on the service rates, the numbers of servers in each group, the size of the intermediate buffer and the unblocking rule followed when system becomes blocked. The critical input rate is determined in a unified manner. For stable queues, it is shown how the stationary probability vector and other important features of the queue may be computed. The essential step in the algorithm is the evaluation of the unique positive solution of a quadratic matrix equation. Author (GRA)

N79-13769# Colorado Univ., Boulder. Dept. of Electrical Engineering.
QUANTITATIVE SYNTHESIS OF UNCERTAIN MULTIPLE INPUT-OUTPUT FEEDBACK SYSTEM Interim Report
Isaac M. Horowitz Aug. 1978 53 p refs
(Grant AF-AFOSR-2946-76; AF Proj. 2304)
(AD-A058943; AFOSR-78-1342TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

There is given an n input, n output plant with a specified range of parameter uncertainty and specified tolerances on the n-squared system response to command functions and the n-squared response to disturbance functions. It is shown how Schauder's fixed point theorem may be used to generate a variety of synthesis techniques, for a large class of such plants. The design guarantees the specifications are satisfied over the range of parameter uncertainty. An attractive property is that design execution is that of successive single loop designs, with no interaction between them and no iteration necessary. Stability over the range of parameter uncertainty is automatically included. By an additional use of Schauder's theorem, these same synthesis techniques can be rigorously used for quantitative design in the same sense as above, for nxn uncertain nonlinear plants, even nonlinear time-varying plants, in response to a finite number of inputs. Author (GRA)

N79-13770# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
A RECURSIVE PROCEDURE FOR UPDATING QUADRATIC FORMS AND ITS APPLICATION TO FEATURE SELECTION Progress Report, 1 Oct. 1976 - 1 Oct. 1977
R. C. Gonzalez and B. M. E. Moret 30 Jan. 1978 208 p refs
(Contract N00014-75-C-0545)
(AD-A058466; ONR-CR215-288-3F) Avail: NTIS HC A10/MF A01 CSCL 09/2

A survey of the problem of the selection of measurements is presented. The Mahalanobis distance is introduced as a selection criterion, and approached from an algebraic point of view. A new method for updating the inverse of a positive definite matrix is derived, and applied to the selection problem. Two interactive procedures are developed and used in experiments with the classic problem of Fisher, with high-resoluton radar images, and with aircraft photographs. Moments are used as features in the last two experiments. Author (GRA)

N79-13989# Joint Publications Research Service, Arlington, Va.
COMPARING EVALUATIONS ON THE ECONOMIC EFFECTIVENESS OF AUTOMATED CONTROL SYSTEMS
S. A. Abramov and L. G. Bulkin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 25-37 Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Ekon. (Moscow), No. 5, Sep. - Oct. 1978 p 72-79 (For primary document see N79-13989 04-99)
Copyright. Avail: NTIS HC A05/MF A01

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N79-13771 Dartmouth Coll., Hanover, N.H.
THE SQUARE CLASS INVARIANT FOR QUADRATIC FORMS Ph.D. Thesis
Anita Eve Solow 1978 80 p
Avail: Univ. Microfilms Order No. 7822035

Let F be a field of characteristic not two. For each quadratic form q over F, the square class invariant of q is defined as a map from the square class group to the integers. After establishing some of the basic properties of the square class invariant, it is used to provide a uniform solution to the Classification Problem for quadratic forms over quadratically closed fields, real closed fields, finite fields, pythagorean fields with a finite number of square classes satisfying SAP, superpythagorean fields, local fields for which the square class invariant classifies quadratic forms over their residue class fields, and nonformally real fields for which the u-invariant equals the number of square classes and is finite. Dissert. Abstr.

N79-13772 Michigan Univ., Ann Arbor.
EFFICIENT BRANCH-AND-BOUND ALGORITHMS FOR PERMUTATION PROBLEMS Ph.D. Thesis
John Dallas Maybee 1978 145 p
Avail: Univ. Microfilms Order No. 7822958

A methodology for the design and development of efficient branch-and-bound algorithms is established. Computer CPU time is used as the efficiency criterion and the work is directed at problems requiring the optimization of a function of a permutation. The methodology structures four stages of algorithm development: design experimentation, evaluation, and refinement. The design stage compares and evaluates basic design alternatives. Emphasis is placed on the branching bounding and node selection operations since each is critical to algorithm efficiency. A model is developed as a conceptual tool to illustrate the effects on algorithm efficiency that can be produced with alternative designs to these operations. Experimentation is advocated as a means of gathering pertinent data for evaluating the effects of selected design alternatives. Dissert. Abstr.

N79-13773 Stanford Univ., Calif.
ON THE PROBLEM OF MEASUREMENT SELECTION Ph.D. Thesis
Jean M. VanCampenhout 1978 93 p
Avail: Univ. Microfilms Order No. 7822588

The problem of selecting good subsets of measurements in Bayesian classification and linear regression is considered. Two performance criteria are isolated: the Bayes risk in classification problems, and the residual sum of squares in linear regression. For an important category of classification problems, the Bayes risk is shown to have properties very similar to the properties of the residual sum of squares in regression, permitting a largely parallel treatment of the associated measurement selection problems. The Hughes Paradox of pattern recognition is resolved. Classification problem, with class-conditionally independent binary

measurements and with univariate class-conditionally jointly Gaussian measurements are discussed. It is shown that in these cases, the Bayes risk does not induce all generally attainable, or isotone, measurement subset orderings. Dissert. Abstr.

N79-13774 Washington Univ., Seattle.
MODELS FOR FINITE PRECISION ARITHMETIC, WITH APPLICATION TO THE DIGITAL IMPLEMENTATION OF KALMAN FILTERS Ph.D. Thesis
Anekal Bheemarau Sripad 1978 151 p
Avail: Univ. Microfilms Order No. 7823150

Statistical models are developed to represent various finite precision arithmetic operations and the use of these models in predicting the performance of Kalman filters implemented using fixed-point arithmetic is described. The statistical properties of a Gaussian noise sequence are studied, and a analysis for Gaussian inputs is given. The distribution of the mantissa for Gaussian inputs is investigated. A model to represent a floating point quantizer with a mantissa having a reciprocal density is developed. A method to analyze the degradation in performance of a fixed-point arithmetic implementation of Kalman filters with precomputed gains is given using the quantizer models developed. A quantitative way to compare the degradation in the implementation of two realizations of Kalman filter is developed. Simulation studies are performed to demonstrate how closely the analytical predictions agree with the actual results. Dissert. Abstr.

N79-13775# Center for Naval Analyses, Arlington, Va.
OSCILLATIONS, FLUCTUATIONS, AND THE HOPF BIFURCATION
Marc Mangel Jun. 1978 47 p refs
(AD-A058537; CNA-PP-225) Avail: NTIS HC A03/MF A01 CSCL 12/1

Consider the effects of small random perturbations on deterministic systems of differential equations. The deterministic systems of interest have oscillatory dynamics and may undergo a bifurcation (the Hopf bifurcation). A first exit problem is formulated for experiments beginning near stable and unstable limit cycles. The unstable limit cycle is surrounded by an annulus. Of interest is the probability of first exit from the annulus through a specified boundary, conditioned on initial position. The diffusion approximation is used, so that the conditional probability satisfies a backward diffusion equation. Appropriate solutions on the backward equation are constructed by an asymptotic method. The behavior of the stochastic system in the vicinity of stable and unstable limit cycles is compared. When the deterministic system exhibits the Hopf bifurcation, the above analysis must be modified. GRA

N79-13776# Center for Naval Analyses, Arlington, Va.
ON SINGULAR CHARACTERISTIC INITIAL VALUE PROBLEMS WITH UNIQUE SOLUTIONS
Marc Mangel Jun. 1978 26 p refs
(AD-A058535; CNA-PP-212) Avail: NTIS HC A03/MF A01 CSCL 12/1

A special class of characteristic first-order initial value problems are considered. The initial value problem arises in the asymptotic solution of parabolic and elliptic equations. The problem is characterized by a singular, characteristic initial manifold. Namely, initial data is given on a characteristic curve. The characteristic curve is also singular in that there is a point on the initial manifold where the equation = 0. That such problems have unique solutions is proven. The theorem also has an interesting interpretation in terms of the calculus of variations. GRA

N79-13777# Maryland Univ., College Park. Computer Science Center.
CELLULAR GRAPH ACCEPTORS, 4 Interim Report
Angela Wu Jun. 1978 52 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A058792; CSC-TR-667; AFOSR-78-1363TR) Avail: NTIS HC A04/MF A01 CSCL 09/4

Diameter-time algorithms are presented for recognition of rectangular and square arrays, Eulerian graphs, bipartite and complete bipartite graphs, stars, and wheels by cellular d-graph acceptors. Slower algorithms are given for construction of a depth-first spanning tree (area time) and for identification of cut nodes, borders, and central points (diameter:area time). The recognition of planarity is also discussed. Author (GRA)

N79-13778# Utah Univ., Salt Lake City. Dept. of Computer Science.
DISPLAY OF COMPLEX THREE DIMENSIONAL FINITE ELEMENT MODELS Final Technical Report, 1 May 1975 - 30 Sep. 1977
David C. Evans, Henry N. Christiansen (Brigham Young Univ.), and Thomas W. Sederberg (Brigham Young Univ.) Apr. 1978 104 p refs
(Contract N00014-75-C-0194)
(AD-A058886; UTEC-CSC-78-135) Avail: NTIS HC A06/MF A01 CSCL 12/1

Complex three dimensional models can be displayed after an automatic generation of a finite element (panel) mapping. Although this automatic generation algorithm fails at certain levels of model complexity, the elimination of these failures can be accomplished through user interaction. This report presents the algorithm solution to the problem of converting a contour definition of an arbitrary surface into a panel definition. The algorithm has been rigorously tested and experience with a highly complex data base lends credence to the claim of a general solution. Future work might focus on reducing the amount of user dependence in the algorithm, although most reasonable cases currently require no user interaction. Author (GRA)

N79-13779# Delaware Univ., Newark. Inst. for Mathematical Sciences.
LOW FREQUENCY ITERATIVE SOLUTION OF INTEGRAL EQUATIONS IN ELECTROMAGNETIC SCATTERING THEORY Interim Report
George A. Gray May 1978 199 p refs
(Grant AF-AFOSR-2634-74; AF Proj. 2304)
(AD-A059170; IMS-TR-35; AFOSR-78-1291TR) Avail: NTIS HC A09/MF A01 CSCL 12/1

This report investigates the scattering of electromagnetic waves by a perfectly conducting object. The incident field is assumed to be time harmonic and the scatterer a closed bounded Lyapunov surface with no holes. A boundary integral equation for the total field (incident plus scattered) is derived using an integral representation of the total field analogous to Green's formula. The proof that this boundary integral equation can be solved by iteration rests on showing that the spectral radius of the resulting integral operator is less than one for small perturbations of the corresponding potential operator.
Author (GRA)

N79-13780# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
THE RENORMALIZED NUMEROV METHOD APPLIED TO CALCULATION OF ROUND STATES OF THE COUPLED-CHANNEL SCHROEDINGER EQUATION Interim Report
Bernard R. Johnson 25 Aug. 1978 46 p refs
(Contract F04701-77-C-0078)
(AD-A059277; TR-0078(3970-40)-4; SAMSO-TR-78-110) Avail: NTIS HC A03/MF A01 CSCL 12/1

The renormalized Numerov method that was recently developed and applied to the one-dimensional bound state problem has been generalized to compute bound states of the coupled-channel Schroedinger equation. Included in this presentation is a generalization of the concept of a wavefunction node and a method for detecting these nodes. By using node count information, it is possible to converge to any specific eigenvalue without the need of an initial close guess and also to calculate degenerate eigenvalues and determine their degree of degeneracy. A useful interpolation formula for calculating the eigenfunctions at nongrid points is also given. Results of sample calculations are presented and discussed. GRA

N79-13781# Naval Underwater Systems Center, New London, Conn.
UPPER BOUNDS FOR RATIOS OF L SUB p NORMS ON FINITE DIMENSIONAL SPACES VIA SPECTRAL ESTIMATES
Roy Leon Streit 18 Jul. 1978 159 p refs
(AD-A059027; NUSC-TR-5915) Avail: NTIS HC A08/MF A01 CSCL 12/1

The L sub 2p norm, for positive integers p, of a real (complex) polynomial pi sub n of degree at most n is shown to be the positive 2p-th root of a constrained quadratic (hermitian) form of a certain linear operator. The 2p-th root of the spectral radius of this linear operator is shown to give an upper bound for the supremum of the ratio of the L sub 2p norm to the L sub 2 norm of pi sub n, where the supremum is taken over arbitrary real (complex) polynomials pi sub n. The underlying technique is not restricted to polynomials, and a generalization of these results to arbitrary finite dimensional function spaces which satisfy a certain Non-negativity Condition is presented. GRA

N79-13782# Minnesota Univ., Minneapolis. Dept. of Theoretical Statistics.
BRUNN-MINKOWSKI INEQUALITY AND ITS AFTERMATH
Somesh DasGupta 28 Jul. 1978 34 p refs
(Grant DAAG29-76-G-0038)
(AD-A059030; UMN/DTS/TR-310; ARO-13149.7-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

Two generalizations of Brunn-Minkowski inequality for convex sets are presented along with their direct and simple proofs. Literature in this area is reviewed. The connection between Anderson's inequality and these inequalities is discussed. Several references for statistical applications are cited. Different concepts of multivariate unimodality are reviewed. Author (GRA)

N79-13783# Syracuse Univ., N. Y. Dept. of Industrial Engineering and Operations Research.
CONVERGENCE OF INTEGRALS WHOSE INTEGRANDS AND MEASURES CONVERGE Interim Report
Richard F. Serfozo Aug. 1978 25 p refs
(Grants AF-AFOSR-2627-74; NSF ENG-75-13653)
(AD-A059229; AFOSR-78-1343TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Classical integral convergence theorems, such as the dominated convergence theorem, describe the convergence of integrals mu f sub n when f sub n approaches f in mu-measure and the f sub n are uniformly mu-integrable. GRA

N79-13784# Army Communications Research and Development Command, Fort Monmouth, N. J.
ERROR CORRECTION CODES
James E. Barton Jul. 1978 27 p
(AD-A059148; CORADCOM-78-4) Avail: NTIS HC A03/MF A01 CSCL 09/4

This report presents an error correction bound derived from considerations of the structure and optimum distribution of redundant digits in an error correction code. GRA

N79-13785# California Univ., Berkeley. Electrical Research Lab.
HOW FAR SHOULD YOU GO WITH THE LANCZOS PROCESS Final Report
W. Kahan and Beresford N. Parlett Jul. 1978 18 p refs
(Contract N00014-69-A-0200-1017)
(AD-A059145; UCB/ERL-M78/48; X-748) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Lanczos algorithm can be used to approximate both the largest and smallest eigenvalues of a symmetric matrix whose order is so large that similarity transformations are not feasible. The algorithm builds up a tridiagonal matrix row by row and the key question is when to stop. An analysis leads to a stopping criterion which is inspired by a useful error bound on the computed eigenvalues. Author (GRA)

N79-13786# Arizona Univ., Tucson. Dept. of Mathematics.
AN ASYMPTOTIC THEORY FOR A CLASS OF NONLINEAR ROBIN PROBLEMS
F. A. Howes Aug. 1978 62 p refs Prepared in cooperation with Minnesota Univ., Minneapolis
(Contract N00014-76-C-0326; Grant NSF MCS-78-00907)
(AD-A059043; TR-24) Avail: NTIS HC A04/MF A01 CSCL 12/1

The existence and the asymptotic behavior of solutions of a class of singularly perturbed second-order Robin boundary value problems are studied by means of nonlinear stability theory. Several examples are discussed in detail. Author (GRA)

N79-13787# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mathematics and Statistics.
SIMULTANEOUS CONFIDENCE INTERVALS FOR LINEAR COMBINATIONS OF TWO INVERSE LINEAR REGRESSION PARAMETERS
S. Zacks 21 Aug. 1978 23 p refs
(Contract N00014-75-C-0529)
(AD-A058809; TR-32) Avail: NTIS HC A02/MF A01 CSCL 12/1

Confidence intervals for the inverse linear regression parameter can be obtained from the least-squares estimators of the regression coefficients by applying the celebrated Fieller Theorem. In the present paper we develop a method based on the simultaneous application of Fieller's Theorem to obtain simultaneous confidence intervals to any linear combination of the inverse regressions of two independent regression lines, which are not parallel. Computer subroutine functions are provided to assist in actual computations. The exact confidence limits are compared numerically to asymptotic confidence limits in order to illustrate the deficiency of the method based on asymptotic formula. An application to comparative (non-dilution) bioassays is shown too. Author (GRA)

N79-13788# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN ADAPTIVE FINITE-DIFFERENCE METHOD FOR SOLVING THE STURM-LIOUVILLE PROBLEM Ph.D. Thesis
David Alan Nelson 1978 191 p refs
(AD-A058413; AFIT-CI-78-22) Avail: NTIS HC A09/MF A01 CSCL 12/1

The Sturm-Liouville (S-L) boundary value problem arises frequently in the study of mathematical physics. Most problems cannot be solved analytically and therefore must be solved with one of the many numerical techniques available. The majority of the current methods use either a uniform mesh or a predetermined non-uniform mesh on which to approximate the problem. It is widely accepted that such problems can be solved more accurately and efficiently with an adaptive method. In this thesis, primarily, the finite-difference methods are discussed for solving the S-L problem. An adaptive finite-difference method is developed in which the final mesh of grid points depends on the solution. The non-uniform discretization and the resulting matrix problem are explored in detail by establishing all the important properties, selecting a solution method, deriving convergence results and error estimates, and examining mesh refinement criteria. GRA

N79-13789# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
ON THE COMPLEXITY OF COMPOSITION AND GENERALIZED COMPOSITION OF POWER SERIES Interim Report
R. P. Brent and J. F. Traub May 1978 36 p
(Contract N00014-76-C-0370; Grant NSF MCS-75-222)
(AD-A058743; CMU-CS-78-128) Avail: NTIS HC A03/MF A01 CSCL 12/1

Let F(x) = f1x - f2(x)(x) - ... be a formal power series over a field Delta. Let F superscript 0(x) = x and for q = 1,2,..., define F superscript q(x) = F superscript (q-1) (F(x)). The obvious algorithm for computing the first n terms of F superscript q(x) is by the composition position analogue of repeated squaring. This algorithm has complexity about log 2 q times that of a single composition. The factor log 2 q can be eliminated in the computation of the first n terms of (F(x)) to the q power by a change of representation, using the logarithm and exponential functions. The factor log 2 q can also be eliminated for the composition problem. F superscript q(x) can often, but not always, be defined for more gneral q. Algorithms and complexity bounds for computing the first n terms of F superscript q(x) whenever it is defined is given. GRA

N79-13790# Aerospace Corp., El Segundo, Calif. Engineering Group.
A COMPACT ALGORITHM FOR COMPUTING THE STATIONARY POINT OF A QUADRATIC FUNCTION SUBJECT TO LINEAR CONSTRAINTS Final Report
J. T. Betts 8 Jul. 1978 21 p refs
(Contract F04701-77-C-0078)
(AD-A058455; TR-0078(3901-03)-1; SAMSO-TR-78-44) Avail: NTIS HC A02/MF A01 CSCL 12/1

An algorithm is presented for computing the stationary point

of a quadratic function of n variables subject to a set of m(m < or = n) linear equality constraints. The procedure is compact in the sense that it requires no two-dimensional arrays of computer storage beyond that needed to store the problem data. The use of a Householder orthogonal decomposition by the method should not degrade the numerical conditioning of the original problem. The method is applicable to problems with singular Hessian matrices, and can be adapted for use in a general quadratic programming algorithm. Author (GRA)

N79-13791# Cornell Univ., Ithaca, N. Y. Dept. of Computer Science.
THE DIRECTED SUBGRAPH HOMEOMORPHISM PROBLEM
Steven Fortune, John Hopcroft, and James Wyllie Jun. 1978 23 p refs
(Contract N00014-76-C-0018)
(AD-A058452; CU-CSD-TR-78-342) Avail: NTIS HC A02/MF A01 CSCL 12/1

The set of pattern graphs for which the fixed directed subgraph homeomorphism problem is NP-complete is characterized. A polynomial time algorithm is given for the remaining cases. The restricted problem where the input graph is a directed acyclic graph is in polynomial time for all pattern graphs and algorithm is given. Author (GRA)

N79-13792# SRI International Corp., Menlo Park, Calif.
A PROOF OF THE CORRECTNESS OF A SIMPLE PARSER OF EXPRESSIONS BY THE BOYER-MOORE SYSTEM
Paul Y. Gloess Aug. 1978 54 p refs
(Contract N00014-75-C-0816)
(AD-A058615; SRI-TR-7) Avail: NTIS HC A04/MF A01 CSCL 05/7

The objective of this report is to convey the essential idea of a proof by the Boyer-Moore Theorem Prover of the correctness of a parser. The proof required a total of 147 definitions and lemmas--all of which have been listed in the appendix. Author (GRA)

N79-13793# Stanford Univ., Calif. Dept. of Computer Science.
NUMERICAL ALGORITHMS FOR NONLINEARLY CONSTRAINED OPTIMIZATION Ph.D. Thesis
Michael Thomas Heath Apr. 1978 152 p refs
(Contract EY-76-S-03-0326; Grant DAHC04-76-G-0185)
(AD-A057962; SU-STAN-CS-78-656) Avail: NTIS HC A08/MF A01 CSCL 12/1

This dissertation is concerned with the development and numerical implementation of algorithms for solving finite dimensional optimization problems. Special emphasis is given to robustness, by which is meant the ability of an algorithm to cope with adverse circumstances, whether due to pathologies of a particular problem or to the shortcomings of finite precision computer arithmetic. A uniform framework is developed in which a common set of techniques may be applied to all of the standard problems of optimization. The algorithms are based on Newton-like methods implemented in a robust manner by means of hybrid, curved line searches and stable linear algebra techniques. Developed first in the context of systems of nonlinear equations, nonlinear least squares, and unconstrained minimization, the algorithms are combined and extended to include problems with equality or inequality constraints. Constrained problems are handled by means of separate line searches in the range and null spaces of the matrix of constraint normals. The classical Lagrangian is modified to allow the same Newton-like methods to be applied to inequality constraints. Test results are presented which show the validity and promise of the methods developed in this dissertation. Author (GRA)

N79-13794# Argonne National Lab., Ill.
INTRODUCTION TO FAULT TREE SYNTHESIS USING LAPP-POWERS METHODOLOGY
E. P. Lynch 1978 26 p refs Presented at the 1978 Symp. on Instrumentation and Control for Fossil Demonstration, Newport Beach, Calif., 19-21 Jun. 1978
(ANL/EES/CP-3; Conf-780656-1) Avail: NTIS HC A03/MF A01

Fault tree analysis is a method of determining the possibility and/or probability that a specific designated failure will occur. A complete logic diagram is constructed that identifies the immediate precursor events leading to the failure, the precursors of these events, and so on until pyramid structure of tree is generated. A probability is assigned to each event in the tree, and the overall probability of the designated failure is calculated. The reader is shown how logic diagrams may be used in fault tree work, through the techniques developed by Lapp and Powers. Only simple systems are considered. Systems involving combinational logic only are discussed and, a sequential logic system in which one or more events cannot occur until one or more previous events are completed is examined. DOE

N79-13795# Brown Univ., Providence, R. I. Div. of Applied Mathematics.
FORCED OSCILLATIONS OF NONSPHERICAL BUBBLES
D. Y. Hsieh May 1978 22 p refs
(Contract EG-77-S-02-4155)
(COO-4155-4) Avail: NTIS HC A03/MF A01

Various aspects of an oscillating bubble are presented. The general formulation and the linear spherical oscillation are discussed, followed by a corresponding variational treatment. Nonlinear subharmonic spherical oscillations and nonspherical oscillation are presented. The study of nonspherical oscillation leads to a discussion on the nonlinear Mathieu equation. The variational method is employed for the study of the coupling between subharmonic spherical oscillation and nonspherical oscillation through nonlinear interaction. Experimental implication of the nonlinear coupling is briefly discussed. DOE

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N79-13796 Texas Univ. at Galveston.
A TEST OF NORMALITY FOR SYMMETRIC DISTRIBUTIONS Ph.D. Thesis
Harvey Bunce, III 1978 66 p
Avail: Univ. Microfilms Order No. 7823298

A test of normality based on the Kolmogorov-Smirnov criterion is developed and evaluated. The new test is designed for the case where the variable under study has a symmetric distribution and the parameters of its distribution are unknown. The distribution of the new test statistic is estimated with an automated simulation procedure. The power of the new test is found superior to the power of the usual Kolmogorov-Smirnov test of normality for a wide range of symmetric distributions and for the one slightly asymmetric distribution considered. The superior power of the new test is of great importance since the question of normality becomes a practical problem only when a sample data set is unimodal and reasonably symmetric. Dissert. Abstr.

N79-13797 Michigan Univ., Ann Arbor.
SPECTRAL ESTIMATION OF ALL POLE PROCESSES USING BAYESIAN TECHNIQUES Ph.D. Thesis
Ronald James Carpinella 1978 218 p
Avail: Univ. Microfilms Order No. 7822869

The problem considered is the spectral estimation of Mth order stationary Gaussian processes which possess an all pole spectral representation. This spectral estimate is determined through the application of Bayes rule, to find the post probability density functions. The problem is cast as a Bayesian parameter estimation problem. The use of a finite dimensional set of sufficient statistics facilitates the problem solution. The solutions presented are limited to the M=1, and M=2 case, but these results can be extended to higher order finite dimensional processes. The observation probability density function is obtained by modeling the observations as being rapidly sampled and representable by an autoregressive process which under this rapid sampling has the same second order properties as the process under investigation. In the rapidly sampled environment, the slope of the high frequency spectral asymptote is learned faster than the other parameters in the spectral representation. Dissert. Abstr.

N79-13798# Brown Univ., Providence, R. I. Div. of Applied Mathematics.
OPTIMAL CONTROL OF MARKOV DIFFUSION PROCESSES Interim Report
Wendell H. Fleming 1978 8 p refs
(Grants AF-AFOSR-3063-76; NSF MCS-76-07261)
(AD-A058874; AFOSR-78-1360TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Some results from optimal stochastic theory are surveyed in this paper, with particular emphasis on control of diffusion processes. Methods for obtaining necessary and sufficient conditions for an optimum are obtained, as well as some techniques for approximate solution. A new application of stochastic control methods is made to obtain Ventcel-Freidlin type estimates for the probability that the states of a diffusion process remain in a given region during a given time period.
Author (GRA)

N79-13799# North Carolina Univ. at Chapel Hill. Dept. of Biostatistics.
ON JACKKNIFING IN ESTIMATING THE FINITE END-POINTS OF A DISTRIBUTION Interim Report
Pranab Kumar Sen 1978 11 p refs
(Grant AF-AFOSR-2736-74; AF Proj. 2304)
(AD-A058963; AFOSR-78-1271TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Sample extreme values are biased estimators of the end-points of a distribution, and hence, jackknifing is useful. However, the properties of jackknifing in such a case differ considerably from those in the regular case. These are studied here. Along with a modification of jackknifing, some applications are also considered.
Author (GRA)

N79-13800# North Carolina Univ. at Chapel Hill. Inst. of Statistics.
COMPARISONS OF THE PERCENTAGE POINTS OF DISTRIBUTIONS WITH THE SAME FIRST FOUR MOMENTS, CHOSEN FROM EIGHT DIFFERENT SYSTEMS OF FREQUENCY CURVES
E. S. Pearson (Univ., Coll., London), N. L. Johnson, and I. W. Burr (Purdue Univ.) Jun. 1978 40 p refs
(Contract DAAG29-77-C-0035)
(AD-A058949; MIMEO-SER-1181; ARO-14778.2-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

A study was made of the extent to which the probability integrals of members of different systems of univariate, unimodal frequency curves, y = f(x), having identical first four central moments, are in agreement. If the variables, x, are standardized so as to have a zero mean and unit standard deviation, it is possible to investigate to what extent the two shape parameters, often described as measuring skewness and kurtosis, can provide estimates for several different systems of distributions, of the probability integrals. This report presents the results of this study.
GRA

N79-13801# Florida State Univ., Tallahassee. Dept. of Statistics.
ON THE NEGATIVE BINOMIAL CONVERGENCE IN A CLASS OF M-DIMENSIONAL SIMPLE EPIDEMICS Interim Technical Report
H. Lacauo and Naftali A. Langberg Jul. 1978 16 p
(Grants AF-AFOSR-2581-74; AF-AFOSR-3109-76)
(AD-A058941; FSU-STATISTICS-M464; TR-84-AFOSR; AFOSR-78-1232TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Consider a population which is exposed to m infections, and consist initially of N susceptibles. At each point in time at most one susceptible becomes infective, and only from one cause. This m-dimensional simple epidemic is a stochastic process, (X sub N, 1(t),..., S sub N, m(t), with components counting the number of infectives from the respective causes at time t. GRA

N79-13802# Army Materiel Test and Evaluation Directorate, White Sands Missile Range, N. Mex.
STATISTICAL ANALYSIS OF RADIAL ERROR IN TWO DIMENSIONS
Gideon A. Culpepper Aug. 1978 56 p refs
(AD-A059117) Avail: NTIS HC A04/MF A01 CSCL 12/1

This is an expository report on the statistics used in an analysis of two-dimensional radial error (or radial miss-distance). The Rayleigh distribution is the basis of many of the estimators or formulas. The Circular Probable Error (CPE), because of its frequent use in estimating impact accuracy of weapon systems, is given prominence in the following areas: (1) Estimators for the CPE under various conditions, (2) Confidence intervals and hypothesis testing on the CPE, (3) The OC curve for the CPE, (4) Sample size problems associated with the CPE, and (5) Proportion of hits within a specified CPE circle when a bias exists. An estimator for the CPE using the Type 1 Asymptotic Distribution of Minimum Values (Gumbel distribution) is derived. Several numerical examples are given for various types of problems.
Author (GRA)

N79-13803# North Carolina Univ. at Chapel Hill. Dept. of Biostatistics.
INVARIANCE PRINCIPLES FOR JACKKNIFING U-STATISTICS FOR FINITE POPULATION SAMPLING AND SOME APPLICATIONS Interim Report
Hiranmay Majumdar and Pranab Kumar Sen 1978 21 p refs
(Grant AF-AFOSR-2736-74)
(AD-A059014; AFOSR-78-1303TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

For simple random sampling (without replacement) from a finite population, suitable stochastic processes are constructed from the entire sequence of jackknife estimators based on functions of U-statistics and these are approximated in distribution by some Brownian bridge processes. Strong convergence of the Tukey estimator of the variance of jackknife U-statistics has also been established. Some applications of these results in sequential analysis relating to finite population sampling are also considered.
Author (GRA)

N79-13804# Wagner (Daniel H.) Associates, Paoli, Pa.
NUMERICAL OPTIMIZATION OF SEARCH FOR A MOVING TARGET
Lawrence D. Stone, Scott S. Brown, Robert P. Buemi, and Carol R. Hopkins 23 Jun. 1978 188 p refs
(Contract N00014-76-C-0696)
(AD-A058470) Avail: NTIS HC A09/MF A01 CSCL 12/1

The problem of computing an optimal search plan for a moving target is addressed. The majority of the report describes numerical techniques which have been developed to compute optimal search plans for the very broad class of problems in which the target's motion can be modeled by a discrete-time stochastic process and the detection function is exponential. A very efficient algorithm is given to find optimal search plans when the target's motion is modeled by a mixture of discrete time and space Markov processes. A second algorithm is presented to solve the variation of this problem that one encounters when the search effort at each time period is restricted to be uniform over an arbitrary rectangular region. The latter is intended to approximate the problem of choosing a sequence of sonobuoy fields to maximize the probability of detecting a submarine. Examples show that one can often find rectangular plans that are almost as effective as the optimal plan. In addition to the above, an algorithm is presented to find optimal plans for arbitrary discrete time target motion processes which can be modeled by Monte Carlo simulation. All the algorithms have been programmed in FORTRAN and run on a Prime 400 minicomputer. Examples of optimal plans calculated by these algorithms are presented.
GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N79-13805 Texas Univ. at Dallas.
A CLASS OF SOLVABLE PERMUTATION PROBLEMS Ph.D. Thesis
John Nicholas Barrer 1978 78 p
Avail: Univ. Microfilms Order No. 7824325

The properties of several classes of permutation problems which are solvable by a polynomial-time algorithm and attempts

to unify them by examining their association with the assignment problem. Certain non-linear permutation functions can be replaced by linear functions which generate assignment problems whose solutions solve the original permutation problem. The class of problems investigated by Smith are shown to have structurally linear objective functions and the traveling salesman problems investigated by Lawler are shown to have exactly linear objective functions. The investigation of exactly linear functions uses the fact that the dimension of the set of permutation vectors is sq(n-1)+1 and yields three sets of vectors which span this set. Dissert. Abstr.

N79-13806 Washington Univ., Seattle.
REALIZATIONS OF DISCRETE-TIME-SYSTEMS: TWO-DIMENSIONAL TIME BILINEAR SYSTEMS AND ONE-DIMENSIONAL TIME POLYNOMIAL SYSTEMS Ph.D. Thesis
Lok Seng Oei 1977 135 p
Avail: Univ. Microfilms Order No. 7823148

Given an input-output information of the system, a general realization procedure is introduced. The realization algorithm consists of choosing a basis for the state space and expressing the unknown parameters in terms of this basis. Furthermore, the reachability and observability of the system are naturally defined. It is determined that a realization is canonical if and only if it is both reachable and observable. Also included is a realization problem of a one-dimensional time polynomial system, in particular, a linear-in-state system with a polynomial observation equation. With the data obtained through multiple experiments, an infinite information matrix is formed. It is concluded that the finite rank condition of this information matrix is crucial in determining existence criteria for a realization, as well as in establishing an algorithm to explicitly construct the system model. Dissert. Abstr.

N79-13807# National Technical Information Service, Springfield, Va.
NETWORK FLOWS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1970 - Aug. 1978
George W. Reimherr Sep. 1978 320 p Superseded NTIS/PS-77/0891; NTIS/PS-761/-0788; NTIS/PS-75/694; NTIS/PS-75/065
(NTIS/PS-78/1032/8; NTIS/PS-77/0891; NTIS/PS-76/0788; NTIS/PS-75/694; NTIS/PS-75/065) Avail: NTIS HC $28.00/MF $28.00 CSCL 12B

The bibliography cites research concerning applications of network flows to problem solving. Studies on job sequencing, transportation models, water resources, communication systems, data processing, waste disposal, and circuit analysis are included. This updated bibliography contains 316 abstracts, 37 of which are new entries to previous edition. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N79-13808# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
FAST INTERSECTION OF HALF SPACES Interim Report
Kevin Q. Brown 29 Jun. 1978 26 p refs
(Contract N00014-76-C-0829)
(AD-A058787; CMU-CS-78-129) Avail: NTIS HC A03/MF A01 CSCL 09/2

The problem of intersecting N half-spaces in K space is transformed to the problem of constructing the convex hull of N points in K space and a simple intersection problem. GRA

N79-13809# Naval Ship Research and Development Center, Bethesda, Md.
A COMPARISON OF THREE COMPUTER PROGRAMS FOR THE SOLUTION OF AX EQUALS B WHERE A IS SYMMETRIC AND SPARSE Interim Report, Feb. - Jun. 1978
Donald A. Gignac Aug. 1978 17 p refs
(SR0140301)
(AD-A058717; DTNSRDC-78/075) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report documents a continuing investigation of two recent programs for the solution of AX=B where A is symmetric and sparse: the Yale Sparse Matrix Package and the Munksgaard subroutines. These two programs compute direct solutions in core using triangular decomposition and Gaussian elimination, respectively. Their performance is compared with that of an out-of-core Cholesky algorithm equation solver, CSKYDG2. As would be expected, the two in-core equation solvers are much faster than CSKYDG2. The Yale symmetric subroutines range up to six times faster than the Munksgaard subroutines. All three equation solvers provide the same degree of accuracy. However, the two in-core equation solvers require such enormous amounts of core storage that their use is not recommended on the CDC 6000 series of computers in their present form. While CSKYDG2 requires less core storage, its runs on the CDC 6400 cost more because of the repeated use of the random access storage capability. Author (GRA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N79-13810# RCA Astro-Electronics Div., Princeton, N. J.
SPACECRAFT HYDROGEN FREQUENCY STANDARD/CLOCK SYSTEM Final Report
28 Apr. 1978 130 p refs
(Contract N00014-75-C-1148)
(AD-A058889; AE-R-4258) Avail: NTIS HC A07/MF A01 CSCL 22/2

This report covers the development of a Feasibility Demonstration Model of a Hydrogen Clock. A flight model design based on knowledge gained from evaluation of the Feasibility Demonstration Model would have applications as the primary time standard in the NTS-3 satellite and future generations of NAVSTAR Satellites. The design was configured to achieve the best performance within the contractually specified maximum envelope size of 16 in (40.64 cm) diameter by 30 in (76.2 cm) long. A flight model based on the same novel design concepts, but using a shorter cavity of dimensions similar to those successfully used in many masers could be packaged in an envelope 14 in (35.6 cm) in diameter (or slightly less) by 20 in (50.8 cm) long, complete, including electronics. This design uses the proven active mode (maser oscillator), and a TE011 unloaded cavity. A very small maser utilizing the novel hydrogen beam optics, a loaded TE011 cavity, and operating in the passive mode is feasible. An envelope size of approximately 8 in (20.32 cm) in diameter, 16 in (40.64 cm) long, for a hydrogen clock, including the receiver electronics, is possible. GRA

N79-13811# Efratom Systems Corp., Irvine, Calif.
AN INVESTIGATION OF THE TECHNICAL FEASIBILITY OF USING PULSED OPTICAL PUMPING TO ELIMINATE THE LIGHT SHIFT AND TO IMPROVE THE LONG-TERM STABILITY OF PASSIVE RUBIDIUM FREQUENCY STANDARDS Annual Summary Report, 1 Sep. 1977 - 31 Aug. 1978
Thomas C. English, Ernst Jechart, and T. M. Kwon 31 Aug. 1978 86 p refs
(Contract N00014-77-C-0646)
(AD-A058985) Avail: NTIS HC A05/MF A01 CSCL 14/2

A pulsed optical rubidium frequency standard has been constructed with the intent of investigating long-term frequency stability in the absence of light shifts. The short-term frequency stability of this device has been measured and found to be sigma sub Y = 2 time 10 to the -11th power (sq. rt. tau) for tau 1 to 100 sec. Measurements of the long-term frequency stability of this device (24 hour averaging time) show that sigma sub Y is of order parts in 10 to the 12th power, or better. GRA

N79-13812# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
MATERIALS RESEARCH FOR ADVANCED INERTIAL INSTRUMENTATION. TASK 3: RARE EARTH MAGNETIC MATERIAL TECHNOLOGY AS RELATED TO GYRO TORQUERS AND MOTORS Technical Report, 30 Sep. 1977 - 30 Jun. 1978

D. Das, E. Wettstein, and K. Kumar Jul. 1978 68 p refs (Contract N00014-77-C-0388)
(AD-A058690; R-1177) Avail: NTIS HC A04/MF A01 CSCL 20/3

For inertial applications aligned SmCo5 magnets with high flux stability, close-to-zero reversible temperature coefficient of magnetization, and a thermal expansion similar to that of beryllium are required. High flux stability is being attempted by producing high H(cu) (high resistance to demagnetization) and high H(k) (high second quadrant loop squareness) magnets through the attainment of fine grain size, low oxygen content and high density in the material. Low reversible temperature coefficient will be achieved by suitable samarium replacement with a heavier rare earth element while the thermal expansion coefficient will be tailored (to that of beryllium) by controlling the alignment of the crystals in the magnet. In line with these requirements a magnet sintering facility capable of ultra-high vacuum operation has been fabricated for oxygen-free processing of these magnets. Techniques for producing powder with low oxygen contamination (from the environment) have also been developed for this purpose. The total amount of oxygen incorporated into the powder is found to be considerably less than what is obtained with conventional procedures. This has resulted in remarkably high values of H(ci) and H(k) in sintered SmCo5 magnets produced so far. AN unprecedented value of 29 kOe has been measured for H(k) in a few of the magnets as compared to 5 to 10 kOe found tin most commercial magnets. The energy product values of these magnets have been limited to about 13 mGOe because of poor alignment. Pressure sintering (hot isostatic pressing) techniques have also been used for densification of powder compacts. GRA

N79-13813# Addis Translations International, Portola Valley, Calif.
SHAPE OF THE FRONT FACE, INITIALLY PLANE OF A PROJECTILE FIRED BY A LIGHT-GAS GUN
H. Bernier Nov. 1977 35 p refs Transl. into ENGLISH of a French Report, 1977 35 p Presented at the 28th ARA Congr., Eglin, Fla., 28-29 Sep. 1977 Sponsored by DOE Prepared for California Univ., Lawrence Livermore Lab.
(UCRL-Trans-11376; Conf-7709142-1) Avail: NTIS HC A03/MF A01

The experimental results obtained with the light-gas gun show that the projectile impact on the plane of the target is not simultaneous over the entire target surface. During impact the front face of the projectile is oriented obliquely with respect to the target, and is slightly concave, sometimes with a scalloped border. To calculate the disk concavity at impact, it is necessary simultaneously to consider the deformations of the two elements forming the projectile: the disk and the sabot. Because the front of the sabot can deform more easily than the disk, the metal disk becomes more concave than if it were free and subjected to its own inertia. The scalloping is admittedly low amplitude, but may well correspond to a vibrational mode. However, not enough information is available to make a precise conclusion. DOE

N79-13814# New York Univ., N. Y. Courant Inst. of Mathematical Sciences.
RECONNECTION OF MAGNETIC LINES IN AN IDEAL FLUID
H. Grad Apr. 1978 48 p refs
(Contract EY-76-C-02-3077)
(COO-3077-152) Avail: NTIS HC A03/MF A01

The rate of reconnection of magnetic lines at an X-point, also growth of a 'tearing' configuration have always been related to the presence of resistivity or other dissipative mechanisms. These phenomena, exhibiting nonconservation of magnetic line topology, are shown to occur in an ideal, nondissipative fluid, thereby violating beliefs, theorems, and calculations of over a century (including the mathematically equivalent questions involving vortex lines in an ideal fluid). DOE

N79-13815# National Technical Information Service, Springfield, Va.
SUPERCONDUCTING MAGNETS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1976 - Aug. 1978
George W. Reimherr Oct. 1978 276 p Supersedes NTIS/PS-77/0914; NTIS/PS-76/0771; NTIS/PS-75/636
(NTIS/PS-78/1063/3; NTIS/PS-77/0914; NTIS/PS-76/0771; NTIS/PS-75/636) Avail: NTIS HC $28.00/MF $28.00 CSCL 09A

The cited reports discuss research on materials studies, theory, design, and applications of superconducting magnets. Examples of applications include particle accelerators, MHD power generation, superconducting generators, nuclear fusion research devices, energy storage systems, and magnetic levitation. (This updated bibliography contains 271 abstracts, 149 of which are new entries to the previous edition.) GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N79-13816 Stanford Univ., Calif.
ACOUSTIC IMAGING WITH A 100-ELEMENT ELECTRONICALLY SCANNED AND FOCUSED PHASED ARRAY Ph.D. Thesis
Wing Pun Leung 1978 185 p
Avail: Univ. Microfilms Order No. 7822532

The development and applications of an acoustic imaging system containing a 100 element phased receiving array which can scan and focus electronically is described. Two different types of phase contrast techniques for this system were developed. The first type measures the first derivative of the phase profile of an object while the second type detects the direct spatial phase variations. The first type is more suitable for objects with acoustic impedance close to that of water and the second type is geared toward objects with larger acoustic impedance compared with that of water. These two types of phase contrast techniques are complementary to each other. This acoustic imaging system is used to examine some industrial materials. Dissert. Abstr.

N79-13817 Stanford Univ., Calif.
TRANSDUCER ARRAYS SUITABLE FOR ACOUSTIC IMAGING Ph.D. Thesis
Charles Stephen DeSilets 1978 187 p
Avail: Univ. Microfilms Order No. 7822493

The design and development of piezoelastic transducer arrays suitable for use in electronically scanned and focused acoustic imaging systems is described. These arrays are designed to operate in the frequency range 2 - 5 MHz within 45% to 80% fractional bandwidths. Linear arrays of up to 180 elements were built and used extensively in acoustic imaging systems. Particular attention is placed on achieving high transduction efficiency and angular beamwidths of at least + or - 15 deg. An experimental transducer built using the formulated design techniques is described and its characteristics compared to theory. Slotted transducer arrays employing tall, narrow elements are described. A one-dimensional model of this kind of element is formulated, and the effects of coupling between element resonant modes are examined. A variational theory for the effective radiation impedance of a narrow element is formulated and the effect on the transducer characteristic is described. Dissert. Abstr.

N79-13818 Tennessee Univ., Knoxville.
A FINITE ELEMENT APPROACH TO THE PROBLEM OF SOUND PROPAGATION AND ATTENUATION IN JET ENGINE AIR INTAKES Ph.D. Thesis
Ismail Abdelrahman Tag 1978 239 p
Avail: Univ. Microfilms Order No. 7823354

The general nonlinear three-dimensional equation for the acoustic velocity potential is derived by using a perturbation technique. The nonlinear three-dimensional equation is then linearized and solved using a finite element algorithm based on Galerkin formulation for a harmonic time dependence. The solution is carried out in complex number notation for the acoustic velocity potential. Sound pressure levels and acoustic velocities are calculated from post element solutions. A finite element computer program was developed. Exact solutions are compared with the finite element predictions for constant area duct geometries to

assess the accuracy of the numerical technique. The finite element predictions are compared with experimental values for variable area ducts carrying high subsonic Mach number flows and subjected to plane waves and high order mode excitation.
Dissert. Abstr.

N79-13819*# Bionetics Corp., Hampton, Va.
A LABORATORY STUDY OF THE SUBJECTIVE RESPONSE TO HELICOPTER BLADE-SLAP NOISE
Kevin P. Shepherd Dec. 1978 21 p refs
(Contract NAS1-14970)
(NASA-CR-158973) Avail: NTIS HC A02/MF A01 CSCL 20A

The test stimuli recorded during a recent field study consisted of 16 sounds, each presented at 4 peak noise levels. Two helicopters and a fixed-wing aircraft were used. The impulsive characteristics of one helicopter were varied by operating at different rotor speeds, whereas the other helicopter, the noise of which was dominated by the tail rotor, displayed little variation in blade-slap noise. Thirty-two subjects made noisiness judgments on a continuous, 11 point, numerical scale. Preliminary results indicate that proposed impulsiveness corrections provide no significant improvement in the noisiness predictive ability of Effective Perceived Noise Levels (EPNL). For equal EPNL, the two categories of helicopter stimuli, one of which was far more impulsive than the other, showed no difference in judged noisiness. Examination of the physical characteristics of the sounds presented in the laboratory highlighted the difficulty of reproducing acoustical signals with high-crest factors. G.G.

N79-13820*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INITIAL RESULTS OF A POROUS PLUG NOZZLE FOR SUPERSONIC JET NOISE SUPPRESSION
Lucio Maestrello Nov. 1978 21 p refs
(NASA-TM-78802) Avail: NTIS HC A02/MF A01 CSCL 20A

As part of a continuing study of possible methods of jet noise reduction, some tests have been made on a porous plug type noise suppressor. Very little information exists on the aeroacoustic performance of jet nozzles having porous elements designed to eliminate the shock wave in the exhaust stream and by so doing to eliminate the shock associated noise and screech. Some initial results on the aeroacoustic performance of a model porous plug type jet noise suppressor are presented. Included are shadowgraph pictures of the flow exhausting from the porous plug nozzle with the comparable acoustic far-field spectra and cross correlations which illustrate the benefits of the test device. G.Y.

N79-13821*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A THEORETICAL INVESTIGATION OF NOISE REDUCTION THROUGH THE CYLINDRICAL FUSELAGE OF A TWIN-ENGINE, PROPELLER-DRIVEN AIRCRAFT
Rama B. Bhat and John S. Mixson Dec. 1978 47 p refs
(NASA-TP-1325; L-12225) Avail: NTIS HC A03/MF A01 CSCL 20A

Interior noise in the fuselage of a twin-engine, propeller-driven aircraft with two propellers rotating in opposite directions is studied analytically. The fuselage was modeled as a stiffened cylindrical shell with simply supported ends, and the effects of stringers and frames were averaged over the shell surface. An approximate mathematical model of the propeller noise excitation was formulated which includes some of the propeller noise characteristics such as sweeping pressure waves around the sidewalls due to propeller rotation and the localized nature of the excitation with the highest levels near the propeller plane. Results are presented in the form of noise reduction, which is the difference between the levels of external and interior noise. The influence of propeller noise characteristics on the noise reduction was studied. The results indicate that the sweep velocity of the excitation around the fuselage sidewalls is critical to noise reduction. G.G.

N79-13822# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
DIRECT CORRELATION OF NOISE AND FLOW OF A JET USING LASER DOPPLER
W. G. Richarz Jun. 1978 112 p refs Sponsored in part by Natl. Res. Council of Canada
(Grant AF-AFOSR-2808-75)
(UTIAS-230; CN-ISSN-0082-5255) Avail: NTIS HC A06/MF A01

Cross-correlations and cross-spectral densities of the jet noise at 40 deg to the jet axis and the instantaneous turbulent jet flow self and shear source terms were measured at various source positions in the jet. Source distributions, inferred over slices of jet normal to the jet axis, were found to be strongly pear-shaped, rather than axisymmetric, with the small end of the pear pointing toward the observer. Self and shear noise spectra were constructed from the measured cross-spectral densities by a method consistent with the postulated self/shear noise formalism. The two spectra exhibit comparable amplitudes and virtually identical shapes, but are displaced substantially in frequency. Self and shear noise spectra extracted from far field jet noise intensities exhibit the same behavior. On the whole both sets of spectra, although derived from vastly different experimental procedures, are compatible. A.R.H.

N79-13823# Mississippi Univ., University. Physical Acoustics Research Group.
PROPAGATION OF SOUND THROUGH THE ATMOSPHERE. EFFECTS OF GROUND COVER Interim Report, Jun. 1976 - Jun. 1978
H. E. Bass and L. N. Bolen Jun. 1978 66 p refs
(Grant DAAG29-76-G-0258)
(AD-A058948; PARGUM-78-01; ARO-14002.1-EX) Avail: NTIS HC A04/MF A01 CSCL 20/1

Measurements of sound amplitude in the vicinity of a ground plane have been made as a function of frequency of the sound source (100 Hz - 2000 Hz), distance of propagation (5m - 100m), and surface conditions. By treating the impedance as an adjustable parameter, the surface impedance as a function of frequency was determined from the measured amplitudes using the theoretical treatment of a spherical wave in the vicinity of a locally reacting surface. Measurements of the amount of energy coupled into the ground were also made using geophones below the ground surface. Experimental studies of surface impedance should include measurements of soil parameters such as density, specific flow resistance, and moisture content so that comparisons can be made between the results from different laboratories and so that a data base for additional theoretical development can be established. GRA

N79-13824# National Technical Information Service, Springfield, Va.
NOISE CONTROL FOR MOTOR VEHICLES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jul. 1978
Diane M. Cavagnaro Sep. 1978 79 p
(NTIS/PS-78/1010/4) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

These Federally-funded citations cover different methods to control noise generated by motor vehicles. Although most of the studies concern trucks, automobiles, buses, and motorcycles are also covered. The bibliography discusses engine noise suppression, mufflers, and tire noise reduction. GRA

N79-13825# National Technical Information Service, Springfield, Va.
NOISE CONTROL FOR MOTOR VEHICLES. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Sep. 1978
Diane M. Cavagnaro Sep. 1978 159 p
(NTIS/PS-78/1011/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

The controlling of noise from different types of motor vehicles is discussed in these citations from worldwide literature. The cited research reports cover noise control through tire, muffler, and engine design. The types of vehicles studied include automobiles, trucks, buses, and motorcycles. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N79-13828* National Aeronautics and Space Administration. Pasadena Office, Calif.

STABILIZATION OF He2(a 3 SIGMA u+ MOLECULES IN LIQUID HELIUM BY OPTICAL PUMPING FOR VACUUM UV LASER 6 Patent

Jonas S. Zmuidzinas, inventor (to NASA) (JPL) Issued 15 Aug. 1978 5 p Filed 29 Mar. 1977 Supersedes N77-24468 (15 - 15, p. 1994) Sponsored by NASA

(NASA-Case-NPO-13993-1; US-Patent-4,107,627; US-Patent-Appl-SN-782463; US-Patent-Class-331-94.5PE; US-Patent-Class-331-94.5L; US-Patent-Class-331-94.5P) Avail: US Patent and Trademark Office CSCL 20H

A technique is disclosed for achieving large populations of metastable spin-aligned He2(a 3 Sigma u +) molecules in superfluid helium to obtain lasing in the vacuum ultraviolet wavelength regime around 0.0800 micron m by electronically exciting liquid (superfluid) helium with a comparatively low-current electron beam and spin aligning the metastable molecules by means of optical pumping with a modestly-powered (100mW) circularly-polarized continuous wave laser operating at, for example, 0.9096 or 0.4650 micron m. Once a high concentration of spin-aligned He2 (a 3 Sigma u +) is achieved with lifetimes of a few milliseconds, a strong microwave signal destroys the spin alignment and induces a quick collisional transition of He2 (a 3 Sigma u +) molecules to the a 1 Sigma u + state and thereby a lasing transition to the X 1 Sigma g + state.

Official Gazette of the U.S. Patent and Trademark Office

N79-13827 Yale Univ., New Haven, Conn.

THEORY OF ELECTRON MOLECULE INTERACTIONS: CASE STUDIES Ph.D. Thesis

Louis Jean Dube 1978 359 p

Avail: Univ. Microfilms Order No. 7820135

A resonant theory based on the use of a local, complex adiabatic potential to describe the dynamical response of the nuclei in a compound state is presented and applied to two representative examples the 2.3 eV shape resonances in nitrogen and in nitrous oxide. A model developed to describe low energy electron-polar molecular interactions involves (1) separation of the interaction space into an inner region and an outer region (2) use of logarithmic derivative at the boundary of the two regions to mimic the effect of the molecular core; and (3) of the lowest angular mode to describe the angular behavior of the complete wave function of the extra electron. The approach is applied to the bound state problem in lithium chloride and to the scattering problem in hydrogen chloride and lithium fluoride.

Dissert. Abstr.

N79-13828 Colorado Univ. at Boulder.

AN EXPERIMENTAL STUDY OF THE OXYGEN MICROWAVE SPECTRUM Ph.D. Thesis

Gary Gene Gimmestad 1978 103 p

Avail: Univ. Microfilms Order No. 7820512

The microwave spectrum of the (0-16)2 molecule was studied by pressure-scanning dispersion spectroscopy. Measurements were made on twenty-two lines with rotational quantum numbers ranging from 1 to 25. Measured parameters included line included line center frequency, line strength, line width and foreign gas broadening efficiency. Fifteen foreign gases were used in the study from four families; inert gases, diatomic gases, triatomic gases, and alkanes. Refractivities were measured for all but one of the foreign gases. Measured line center frequencies and strengths were in agreement with predictions. A parameter in the latest calculation of line widths was adjusted to produce agreement with the measured values. Foreign gas broadening was investigated in a phenomenological way. An empirical relation was discovered between the broadening efficiency of a foreign gas and the mass and refractivity of the gas, for oxygen lines with low rotational quantum number. Dissert. Abstr.

N79-13829 Illinois Univ. at Urbana-Champaign, Urbana.

SEMICLASSICAL STUDIES IN MOLECULAR DYNAMICS Ph.D. Thesis

Michael Leo Koszykowski 1978 98 p

Avail: Univ. Microfilms Order No. 7820981

Molecular-bound states, molecular collisions, and time-dependent dynamical systems were studied. Semiclassical concepts were used to bridge the gap between exact quantum mechanics and pure classical mechanics. The impact approximation was applied to the classical binary collision operator making it possible to derive an expression for the dipole correlation function for real systems in a form which is computationally tractable and contains no adjustable parameters. Trajectory calculations were performed for the system CO in dense Ar gas. Comparison with experimental data found agreement for certain densities when a quantum correction was included. Vibrational classical trajectories of anharmonic molecules were used here to obtain the classical vibrational autocorrelation function and, via a Fourier transform, the power spectrum of the dynamical variables. Dissert. Abstr.

N79-13830*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

AN EXPERIMENT TO VERIFY THAT THE WEAK INTERACTIONS SATISFY THE STRONG EQUIVALENCE PRINCIPLE

Peter B. Eby Nov. 1978 17 p refs

(NASA-TM-78209) Avail: NTIS HC A02/MF A01 CSCL 20H

The construction of a clock based on the beta decay process is proposed to test for any violations by the weak interaction of the strong equivalence principle bu determining whether the weak interaction coupling constant beta is spatially constant or whether it is a function of gravitational potential (U). The clock can be constructed by simply counting the beta disintegrations of some suitable source. The total number of counts are to be taken a measure of elapsed time. The accuracy of the clock is limited by the statistical fluctuations in the number of counts, N, which is equal to the square root of N. Increasing N gives a corresponding increase in accuracy. A source based on the electron capture process can be used so as to avoid low energy electron discrimination problems. Solid state and gaseous detectors are being considered. While the accuracy of this type of beta decay clock is much less than clocks based on the electromagnetic interaction, there is a corresponding lack of knowledge of the behavior of beta as a function of gravitational potential. No predictions from nonmetric theories as to variations in beta are available as yet, but they may occur at the U/sg C level. A.R.H.

N79-13831# Illinois Univ. at Urbana-Champaign, Urbana. Coordinated Science Lab.

STATISTICS OF 1-DIMENSIONAL ATOM MOTION WITH NEXT-NEAREST NEIGHBOR TRANSITIONS M.S. Thesis

Mark Erickson Twigg Mar. 1978 139 p refs

(Contract DAAB07-72-C-0259; Grant NSF DMR-72-02937)

(AD-A058494; R-811) Avail: NTIS HC A07/MF A01 CSCL 07/4

During the last decade considerable progress has been made in understanding the self-diffusion of metal atoms on well defined crystal planes. This advance has occurred through the use of the field ion microscope, which makes it possible to visualize individual atoms, and to prepare highly perfect surfaces. With this microscope it is possible to determine by direct observation the mean square displacement of atoms adsorbed at a surface, and thus to derive their diffusion coefficient D from Einstein's relation. Author (GRA)

N79-13832# National Bureau of Standards, Washington, D. C. Surface Science Div.

THE GEOMETRY OF CO ON Ru(001): EVIDENCE FOR BENDING VIBRATIONS IN ADSORBED MOLECULES

Theodore E. Madey 1 Sep. 1978 29 p refs

(Contract N00014-78-F-0008)

(AD-A058621; TR-7) Avail: NTIS HC A03/MF A01 CSCL 97/2

As a test of the utility of the ESDIAD method (Electron Stimulated Desorption Ion Angular Distributions) in studies of the geometry of adsorbed molecules, the chemisorption of CO on Ru(001) has been examined. Data previously reported using UPS (ultraviolet photoemission spectroscopy) and EELS (electron energy loss spectroscopy) have indicated that CO is terminally

bonded to the Ru surface through the C atom, with the CO axis perpendicular to the surface. GRA

N79-13833# Naval Research Lab., Washington, D. C. Radiation Technology Div.

DIFFERENTIAL CROSS SECTION AND RELATED INTEGRALS FOR THE MOLIERE POTENTIAL Final Report

George P. Mueller 12 May 1978 12 p refs
(RR0221141)
(AD-A058945; AD-E000197; NRL-8207) Avail: NTIS HC A02/MF A01 CSCL 07/4

The Moliere potential is widely used in radiation-damage simulation studies. It is not much used in transport theory calculations because of the awkward expression for the differential cross section corresponding to the potential. Within the framework of the Lindhard treatment of atomic cross sections, is developed an easy-to-use fit, accurate to 6%, to the Moliere cross section. Simple forms for several related quantities are also presented. GRA

N79-13834# Maryland Univ., College Park. Dept. of Physics and Astronomy.

GENERAL ALGEBRAIC THEORY OF IDENTICAL PARTICLE SCATTERING

G. Bencze and Edward F. Redish Jan. 1978 33 p refs
(Contract EY-76-S-05-5126)
(ORO-5126-33) Avail: NTIS HC A03/MF A01

The nonrelativistic N-body scattering problem is considered for a system of particles in which subsets of the particles are identical. Its is demonstrated how the particle identity can be included in a general class of linear integral equations for scattering operators or components of scattering operators. The Yakubovskii, Yakubovskii-Narodestkii, Rosenberg, and Bencze-Redish-Sloan equations are included in this class. Algebraic methods are used which rely on the properties of the symmetry group of the system. Operators depending only on physically distinguishable labels are introduced and linear integral equations for them are derived. This procedure maximally reduces the number of coupled equations while retaining the connectivity properties of the original equations. DOE

N79-13835# Kansas State Univ., Manhattan. Dept. of Physics.

CHARGE DISTRIBUTIONS FOR RADIOACTIVE AEROSOLS IN A BIPOLAR ATMOSPHERE PERMEATED BY AN ELECTRIC FIELD M.S. Thesis

J. E. Mead 19 Jun. 1978 60 p refs
(Contract W-7405-eng-48)
(UCRL-13861-1) Avail: NTIS HC A04/MF A01

Steady-state charge distributions are obtained for radioactive aerosol particles in bipolar ionized atmospheres with concentrations of 10 to the 2d power to 10 to the 8th power ions/cu cm. Ion-particle attachment is based on a diffusion-conduction model with unequal ion mobilities. Asymptotic formulas for charge distributions are derived from charge transfer rate equations. Cases include low and high specific activities with weak and strong electric fields. Mean charge and variance are obtained for Poisson and shifted Gaussian approximations in the appropriate cases. Comparisons are made with numerically calculated distributions. DOE

N79-13836# Texas Univ., Austin. Center for Particle Theory.

HIGH SPIN EFFECTS IN SUPERDENSE MATTER

R. L. Bowers, A. M. Gleeson, and R. D. Pedigo Apr. 1978 33 p refs
(Contract EY-76-S-05-3992)
(ORO-3992-336) Avail: NTIS HC A03/MF A01

A model of relativistic interacting superdense matter with vector, scalar and symmetric second rank tensor exchange is developed. The Green's functions of the model are solved in the self consistent Hartree approximation. The contributions of the symmetric second rank tensor are emphasized. It is found that these high spin contributions effect the superdense matter at densities just beyond those predicted to occur in neutron star matter or nuclear collisions. The spin-two effects do produce an unusual asymptotic dependence p = -1/3 epsilon. This effect is examined in a simple model of the early universe. DOE

N79-13837*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

UNIFIED CONNECTED THEORY OF FEW-BODY REACTION MECHANISMS IN N-BODY SCATTERING THEORY

W. N. Polyzou and E. F. Redish Apr. 1978 64 p refs Prepared in cooperation with Maryland Univ., College Park
(Contract EX-76-S-05-5126)
(NASA-TM-79967; ORO-5126-40) Avail: NTIS HC A04/MF A01 CSCL 20H

A unified treatment of different reaction mechanisms in nonrelativistic N-body scattering is presented. The theory is based on connected kernel integral equations that are expected to become compact for reasonable constraints on the potentials. The operators T/sub +-//sup ab/(A) are approximate transition operators that describe the scattering proceeding through an arbitrary reaction mechanism A. These operators are uniquely determined by a connected kernel equation and satisfy an optical theorem consistent with the choice of reaction mechanism. Connected kernel equations relating T/sub +-//sup ab/(A) to the full T/sub +-//sup ab/ allow correction of the approximate solutions for any ignored process to any order. This theory gives a unified treatment of all few-body reaction mechanisms with the same dynamic simplicity of a model calculation, but can include complicated reaction mechanisms involving overlapping configurations where it is difficult to formulate models. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N79-13838*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

NUCLEAR GAMMA RAYS FROM ENERGETIC PARTICLE INTERACTIONS

Reuven Ramaty (Tel-Aviv, Univ., Israel), Benzion Kozlovsky (California Univ., Los Angeles), and Richard E. Lingenfelter Sep. 1978 133 p refs Submitted for publication
(NASA-TM-79654) Avail: NTIS HC A07/MF A01 CSCL 20H

Gamma ray line emission from nuclear deexcitation following energetic particle reactions is evaluated. The compiled nuclear data and the calculated gamma ray spectra and intensities can be used for the study of astrophysical sites which contain large fluxes of energetic protons and nuclei. A detailed evaluation of gamma ray line production in the interstellar medium is made. Author

N79-13839# Oakland Univ., Rochester, Mich. Dept. of Chemistry.

THE EVALUATION OF MATRIX ELEMENTS WITH GENERALIZED SPHERICAL GAUSSIAN WAVEFUNCTIONS. PART 2: TWO PARTICLE, MANY-CENTRE FORMS Technical Report, 1 May 1977 - 31 Apr. 1978

P. P. Schmidt Aug. 1978 21 p refs
(Contract N00014-77-C-0293)
(AD-A059130; TR-2) Avail: NTIS HC A02/MF A01 CSCL 20/10

General, algebraic expressions are provided for the two- three-, and four-centre electron repulsion integrals and for the various nuclear attraction integrals evaluated in terms of basis functions of the type (r to the 2n - l power) (Y sub lm (r)) (exp(-alpha r-squared)). The formulae derived are valid for all orders of n, l, and m for each wavefunction. Fourier transform methods together with Moshinsky's solid harmonic addition theorem are used to derive the most compact expressions for the various matrix elements. Author (GRA)

N79-13840# Naval Postgraduate School, Monterey, Calif.

ELECTROEXCITATION OF GIANT RESONANCES BETWEEN 4 MeV AND 48 MeV EXCITATION ENERGY IN 140 Ce M.S. Thesis

Hubert Hass and Daniel Harry Meyer Jun. 1978 72 p refs
(AD-A059060) Avail: NTIS HC A04/MF A01 CSCL 20/8

Electroexcitation of 140 Ce was studied using 92 MeV electrons at scattering angles of 90 and 105 deg, and 80 MeV electrons at 90 deg. An analysis was made using DWBA calculations and the hydrodynamic model. The results agree with previous experiments in cerium and other nuclei and, generally, with the calculations of Bohr and Mottelson, Hamamoto, and Liu and Brown. The Delta T assignments were based on microscopic and macroscopic considerations. GRA

N79-13841# URS/Blume (John A.) and Associates, San Francisco, Calif.
DESIGN COST SCOPING STUDIES. NEVADA TEST SITE TERMINAL WASTE STORAGE PROGRAM, SUBTASK 1.3: FACILITY HARDENING STUDIES
P. I. Yanev and G. N. Owen Apr. 1978 126 p refs
(Contract EY-76-C-08-0099)
(JAB-99-123) Avail: NTIS HC A07/MF A01

Cost estimates for hardening the surface structures, underground tunnels and storage rooms, and vertical shafts of the repository against ground motion caused by earthquakes and underground nuclear explosions (UNEs) were calculated for repositories in three candidate geological materials (Eleana argillite, Climax Stock granite, and Jackass Flats tuff) for several assumed peak ground accelerations caused by earthquakes (0.3g, 0.5g, and 0.7g) and by UNEs (0.5g, 0.7g, and 1.0g). Potential expenditures for seismic hardening of the surface structures were found to be less than 1% of the estimated construction cost of the surface structures. For the underground structures, essentially no hardening was required for peak ground accelerations up to 0.3g; however, added costs ecame significant at 0.5g, with a possible increase in structural costs for the underground facilities of as much as 35% at 1.0g. DOE

N79-13842# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF SAMARIUM-COBALT QUADRUPOLE LENSES FOR PARTICLE ACCELERATOR APPLICATIONS
N. Saito (Hitachi Ltd., Tokyo), E. D. Bush, and D. A. Swenson Jun. 1978 16 p refs Presented at the 3d Intern. Workshop on Rare Earth-Cobalt Perm. Magnets and their Appl., La Jolla, Calif., 27-30 Jun. 1978
(Contract W-7405-eng-36)
(LA-7232-MS; Paper-V-5) Avail: NTIS HC A02/MF A01

A family of samarium-cobalt permanent magnet quadrupole lenses was designed and fabricated for a new breed of proton linear accelerator. Four kinds of geometrical cross sections were investigated. The magnetic field gradients and multipole field harmonics up to n = 14 were measured with some compensated measuring coils for all the above models. Axial and transverse magnetic field surveys were performed with a Hall probe gaussmeter to determine the field gradients and the fringe field distribution. Quadrupole gradients in excess of 10 kG/cm were achieved using samarium-cobalt and certain geometries. These same quantities were calculated by a new computer code PAN-DIRA. The comparison between the calculations and the measurements showed excellent agreements on gradients and harmonic components. The field patterns were produced by PAN-DIRA. Among the above geometries, it turned out that the flat tip pole geometry is most promising. DOE

N79-13843# Sandia Labs., Albuquerque, N. Mex. Beam Source Applications Div.
SYSTEM FOR DETECTING NEUTRONS IN THE HARSH RADIATION ENVIRONMENT OF A RELATIVISTIC ELECTRON BEAM
L. W. Kruse Jun. 1978 44 p refs
(Contract EY-76-C-04-0789)
(SAND-78-0513) Avail: NTIS HC A03/MF A01

Neutron yield and energy in the harsh radiation environment of a relativistic electron beam source were measured using a photomultiplier tube design and special gating methods which provide the basis for novel time-of-flight and total-yield detectors. The technique of activation analysis is expanded to provide a neutron energy spectrometer. There is a demonstrated potential in the use of the integrated system as a valuable diagnostic tool to study particle-beam fusion, intense ion beam interactions, and pulsed neutron sources for simulating weapons effects. A physical lower limit of 10 to the 8th power neutrons into 4 pi is established for accurate and meaningful measurements in the REB environment. DOE

N79-13844# Los Alamos Scientific Lab., N. Mex.
GASEOUS FUEL REACTORS FOR POWER SYSTEMS
H. H. Helmick and F. C. Schwenk 1978 7 p Presented at 13th Intersoc. Energy Conversion Eng. Conf., San Diego, Calif., 20 Aug. 1978
(Contract W-7405-eng-36)
(LA-UR-78-1437; Conf-780801-18) Avail: NTIS HC A02/MF A01

The Los Alamos Scientific Laboratory is participating in a NASA-sponsored program to demonstrate the feasibility of a gaseous uranium fueled reactor. The work is aimed at acquiring experimental and theoretical information for the design of a prototype plasma core reactor which will test heat removal by optical radiation. The basic goal of this work is for space applications, however, other NASA-sponsored work suggests several attractive applications to help meet earth-bound energy needs. The final phase experimental activity now in progress is the fabrication and testing of a buffer gas vortex confinement system. DOE

N79-13845# Los Alamos Scientific Lab., N. Mex.
STATUS REPORT ON NUCLEAR REACTORS FOR SPACE ELECTRIC POWER
D. Buden 1978 14 p Presented at 13th Intersoc. Energy Conversion Eng. Conf., San Diego, Calif., 20 Aug. 1978
(Contract W-7405-eng-36)
(LA-UR-78-1306; Conf-780801-7) Avail: NTIS HC A02/MF A01

Reactor power plants are started for space applications in the late 1980s and 1990s. The study concentrated on high-temperature, compact, fast reactors that can be coupled with various radiation shielding systems and thermoelectric, dynamic or thermionic electric power conversion systems, depending on the mission. High orbits (above 400 to 500 nautical miles)have sufficient lifetimes to allow radioactive elements to decay to safe levels. The major proposed applications for satellites with reactors in earth orbit are in geosynchronous orbit (19,400 nautical miles). In missions at geosynchronous orbit where orbital lifetimes are pratically indefinite the safety considerations are negligible. The potential missions, why reactors are being considered as a prime power candidate, reactor features, and safety considerations are discussed. DOE

N79-13846# California Univ., Berkeley. Lawrence Berkeley Lab.
APPRAISAL OF UNDERGROUND RADIOWAVE WASTE DISPOSAL IN ARGILLACEOUS AND CRYSTALLINE ROCKS: SOME GEOCHEMICAL, GEOMECHANICAL, AND HYDROGEOLOGICAL QUESTIONS
J. A. Apps, N. G. W. Cook, and P. A. Witherspoon Jun. 1978 55 p refs
(Contract W-7405-eng-48)
(LBL-7047) Avail: NTIS HC A04/MF A01

Results are presented of an appraisal of the potential for the storage of radioactive wastes by burial in underground repositories and of efforts to define the more significant factors affecting the selection and design of a repository. Those areas in geomechanics, hydrogeology, and geochemistry where further research is needed to provide answers of the quality and certainty needed to resolve these issues are examined. Results of this appraisal suggest that argillaceous and crystalline rocks may provide suitable sites for nuclear waste repositories. The most important factor affecting their suitability appears to be the flux of groundwater through the repository. Although intense fracturing would be advantageous in retarding migration of hazardous materials from a repository in these rocks by sorption, the hydraulic conductivities of these fractures would have to be very small and the hydraulic gradient low. DOE

N79-13847# Decisions and Designs, Inc., McLean, Va.
INDEX OF HAZARD FOR RADIOACTIVE WASTE Interim Technical Report
S. R. Watson Jun. 1978 80 p refs Revised
(Contract W-7405-eng-48)
(UCRL-13868-1-Rev; PR-78-10-80R) Avail: NTIS

HC A05/MF A01

A study to establish a risk measure for radioactive waste repositories is reported and radiological performance objectives are generated. The problem of regulating radioactive waste repositories is reviewed, and the difficulties associated with this activity are discussed. Risk-benefit analysis as a tool for regulation were suggested, and its contribution is assessed. A utility function is discussed in some detail, paying particular attention to the public concerns. The vexed question of determining an acceptable safety limit is studied and recommendations are made concerning the most suitable way to determine how safe is safe enough. A brief discussion is given of how these concepts may be employed to generate radiological performance objectives. DOE

N79-13848# California Univ., Livermore. Lawrence Livermore Lab.

GEOCHEMISTRY AND RADIONUCLIDE MIGRATION

D. Sherwood 6 Mar. 1978 15 p refs Presented at the Symp. on Waste Management, Tucson, Ariz., 6-8 Mar. 1978

(Contract W-7405-eng-48)

(UCRL-80841; Conf-780316-12) Avail: NTIS HC A02/MF A01

Theoretically, the geochemical barrier can provide a major line of defense in protecting the biosphere from the hazards of nuclear waste. Preliminary investigations suggest that retardation is an effective control on radionuclide concentrations. Ion exchange reactions slow radionuclide migration and allow more time for radioactive decay and dispersion. In site selection, consideration should be given to rock barriers with high ion exchange capacity that might also act as semi-permeable membranes. Also important in evaluating the site's potential for effective geochemical controls are the oxidation potentials, pH and salinity of the groundwater. DOE

N79-13849# Oak Ridge National Lab., Tenn.

PROLIFERATION-RESISTANT NUCLEAR FUEL CYCLES

D. O. Campbell and E. H. Gift Jun. 1978 18 p refs

(Contract W-7405-eng-26)

(ORNL/TM-6392) Avail: NTIS HC A02/MF A01

The properties of plutonium containing unusally large proportions of the 238Pu isotope are considered in relation to resistance to nuclear proliferation. Several fuel cycle modifications for light water reactors are evaluated. It is shown that the 238Pu isotopic concentration can be increased substantially from the approximately 1.5% in discharged fuel from reactors operating presently. Concentrations of 8 to 10% are readily achievable, and values approaching 20% may be practical. DOE

N79-13850# California Univ., Livermore. Lawrence Livermore Lab.

EFFICIENT ENERGETIC NEUTRAL BEAM SOURCE USING JET SURFACE CONVERSION

O. A. Anderson Nov. 1977 18 p refs

(Contract W-7405-eng-48)

(UCID-17659) Avail: NTIS HC A02/MF A01

A method is described for producing an energetic neutral beam of deuterium with high power efficiency. A jet of D(0) particles is incident on a cessium-doped cathode that converts the D(0) to D(-). A grid system adjacent to the cathode accelerates the D(-) ions to 200 keV or more at a current density around 0.25 A/sq cm, and a charge stripping cell reconverts the accelerated particles to D(0). This inherently steady-state system can produce a 250 ampere beam with a single module. Its high gas utilization efficiency eliminates most of the bulky pumps which make other systems hard to use in reactor applications. DOE

N79-13851# Oak Ridge National Lab., Tenn.

HIGH ENERGY RUNAWAY ORBITS IN THE PRESENCE OF m = 2 MAGNETIC ISLANDS

S. J. Zweben, B. V. Waddell, D. W. Swain, and H. H. Fleischman Jul. 1978 32 p refs

(Contract W-7405-eng-26)

(ORNL/TM-6216) Avail: NTIS HC A03/MF A01

A guiding center computer code is used to map out trajectories of collisionless, runaway electronsin the presence of m = 2 magnetic islands in a Tokamak. Low energy runaway drift surfaces follow closely the perturbed poloidal magnetic flux surfaces, as expected. Higher energy runaway orbits are seen to retain an m = 2 structure even though the drift surfaces are shifted considerably outward from the magnetic flux surfaces. The size of the island structure in the drift surfaces decreases as the outward shift becomes larger than the island width. Trapped particle orbits are apparently unaffected by the presenceof the island. Little or no ergodicity of the particle orbits has been observed in this model, although a couplingof the m = 2 island with the m = 1 outward shift can produce an m = 3 structure in the particle drift surfaces. DOE

N79-13852# Mound Lab., Miamisburg, Ohio.

EVALUATION OF THE USE OF CALORIMETRY FOR SHIPPER-RECEIVER MEASUREMENTS OF PLUTONIUM

W. W. Rodenburg Dec. 1977 90 p refs

(Contract EY-76-C-04-0053)

(NUREG/CR-0014; MLM-2518) Avail: NTIS HC A05/MF A01

The relative merit of using calorimetry for standardized measurement of shipper-receiver (S-R) exchanges of plutonium is evaluated. In particular, this evaluation concentrates on the accountability and the diversion detection aspects of the use of calorimetry. Three different modes of use were considered: (1) calorimetry alone, that is, S-R exchanges based on power (watts) measurements; (2) calorimetry plus chemical assay, similar to the present weight plus chemical assay system; and (3) calorimetry plus gamma-ray spectrometry, a totally nondestructive plutonium assay method. The relative merit of each application was judged using the present methods as a base case. DOE

N79-13853# Mound Lab., Miamisburg, Ohio.

TRITIUM WASTE CONTROL, JANUARY - MARCH 1978

30 May 1978 34 p refs

(Contract EY-76-C-04-0053)

(MLM-2519) Avail: NTIS HC A03/MF A01

The combined electrolysis-catalytic-exchange pilot system was modified to improve the reliability of the unit for continuous operation. An experimental run for 60 consecutive hours using a single catalytic exchange column was made to estimate values of height of a transfer unit and height equivalent to a theoretical plate for the pilot system. The calculated values were in agreement with existing data from a bench-scale system. Further experiments were performed with the cryogenic hydrogen isotope distillation system, this time using H2-HT mixtures. Two experiments were successful in separating gaseous hydrogen containing tritium from tritiated water. Triplicate samples of cement, cement-plaster (1:1 ratio by weight), and cement-plaster (1:1 ratio by volume) were injected with 386 Ci of tritium, cured for five days, and then impregnated with catalyzed styrene monomer. After polymerization, the samples were put into a test program to measure the tritium release. No differences were noted from the data on these groups until the polyethylene bottle was removed. DOE

74 OPTICS

Includes light phenomena.

N79-13854 Stanford Univ., Calif.

GENERATION OF COHERENT AND INCOHERENT VACUUM ULTRAVIOLET RADIATION Ph.D. Thesis

Ludwik Jerzy Zych 1978 76 p

Avail: Univ. Microfilms Order No. 7822597

The processes behind both coherent and incoherent VUV light sources with the general aim of developing a short X-ray laser were studied in three projects. An extremely bright incoherent VUV light source based on laser induced emission from a metastable He 2s singlet level is demonstrated. The maximum source brightness, within its narrow linewidth, is that of a blackbody at a temperature characteristic of the metastable storage level. Tripling of coherent 3547 A radiation to 1182 A in Xe-Ar mixtures is investigated. The conversion efficiency for the process is limited by Kerr-induced dispersion to 0.9% and the Kerr effect is a mixed frequency effect which alters the index of refraction at 1182 A due to the presence of large power densities at

3547 A. A compensating scheme using a Xe-Mg-Ar mixture aimed at reducing the effect, and thus permitting increased efficiencies, is proposed. Dissert. Abstr.

N79-13855* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SIMULATOR METHOD AND APPARATUS FOR PRACTICING THE MATING OF AN OBSERVER-CONTROLLED OBJECT WITH A TARGET Patent

Walter K. Polstorff Issued 15 Aug. 1978 10 p Filed 25 Feb. 1977 Supersedes N77-18179 (15 - 09, p 1139) Continuation-in-part of abandoned US Patent Appl. SN-590183, filed 25 Jun. 1975

(NASA-Case-MFS-23052-2; US-Patent-4,106,218; US-Patent-Appl-SN-772165; US-Patent-Class-35-12C; US-Patent-Class-35-12N; US-Patent-Class-358-104; US-Patent-Appl-SN-590183) Avail: US Patent and Trademark Office CSCL 20F

A servo controlled target replica, and a surface bearing a computer generated line drawing of an object are individually viewed by separate television cameras allowing a two-dimensional composite of the target replica and the object to be displayed on a monitor simulating what an observer would see through a window in a spacecraft. The target replica is coded along one self coordinate axis in such a way that the distance of an elemental area on the target along the axis is capable of being remotely readout by a television camera. A third television camera responsive to the code reads out this information by which the Z-coordinate, relative to the observer, can be calculated, on-line with the scan, for the contents of each picture element of the scene televised by the target camera. Official Gazette of the U.S. Patent and Trademark Office

N79-13856# John Carroll Univ., Cleveland, Ohio. Dept. of Physics.

ACOUSTICALLY INDUCED PHASE AND INTENSITY MODULATION IN OPTICAL FIBERS

E. F. Carome and M. P. Satyshur 22 Aug. 1978 45 p refs (Contract N00014-75-C-0247; NR Proj. 384-309)

(AD-A058694; PH-78-2) Avail: NTIS HC A03/MF A01 CSCL 20/6

Studies have been made on the use of long length, low-loss optical fiber coils as direct acoustic sensors. The theory of optical mode propagation in step index fibers is briefly presented. Phase modulation theory is considered and then applied to a fiber that propagates only the first four optical modes. The results of this theory are then compared to experimental data obtained using such a fiber. When a fiber coil is exposed to a sinusoidal pressure variation in water two phase modulation processes are easily detected. The first is due to interference between directly transmitted and back and forth reflected beams. The second arises because of interference between two propagating modes in the fiber. Data obtained on these two processes are discussed in detail. Experimental data is also presented on intensity modulation effects detected in several different multimode step index fibers. Author (GRA)

N79-13857# University of Southern Calif., Los Angeles. Image Processing Inst.

QUANTITATIVE METHODS OF EDGE DETECTION

Ikram Escandar Abdou Jul. 1978 180 p refs

(Contract F33615-76-C-1203; ARPA Order 3119)

(AD-A059124; USCIPI-830) Avail: NTIS HC A09/MF A01 CSCL 20/6

Most local operators used in edge detection can be modelled by one of two methods: edge enhancement/thresholding and edge fitting. This dissertation presents a quantitative design and performance evaluation of these methods. The design techniques are based on statistical detection theory and deterministic pattern recognition classification procedure. The performance evaluation methods developed include: (1) deterministic measurement of the edge gradient amplitude; (2) comparison of the probabilities of correct and false edge detection; and (3) figure of merit computation. The design techniques developed are used to optimally design a variety of small and large mask edge enhancement/thresholding operators. A performance comparison is given between these edge detectors. A new edge fitting algorithm is introduced. The new algorithm is derived in the discrete domain, this allows a direct optimization of the operator's performance. The advantages of new algorithm are better performance with real world pictures and less sensitivity to signal-to-noise ratio. Author (GRA)

N79-13858# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.

MEASUREMENT OF FREQUENCY OF LIGHT AND ITS APPLICATIONS Final Report, 1 Jun. 1975 - 31 May 1978

Ali Javan and Michael S. Field 1 Aug. 1978 231 p refs (Contract DAAG29-75-C-0026)

(AD-A058441; ARO-13227.12-P) Avail: NTIS HC A11/MF A01 CSCL 17/5

This three-year contract has covered many rich areas of physics. Measurement of the velocity of light provided equipment and techniques for studying the anomalous Zeeman effect. Several important theoretical studies on superradiance were conducted. The whole field of time delayed laser saturation spectroscopy was opened. A study has been made of the mechanism of optically pumping far infrared lasers. The metal-oxide-metal diode was analysed theoretically and results verified experimentally. Guidelines are given for lithographic fabrication of thin film structures to operate in the 10 micron region of the infrared spectrum. Author (GRA)

N79-13859# Boeing Aerospace Co., Seattle, Wash. Navy Systems and Advanced Projects Div.

FEASIBILITY DEMONSTRATION OF FIBER OPTIC DIGITAL STATUS MONITORING DEVICES Final Engineering Report, Jan. 1977 - Mar. 1978

Glen E. Miller Mar. 1978 137 p

(Contract N00019-77-C-0039)

(AD-A059016; D296-10048-1) Avail: NTIS HC A07/MF A01 CSCL 14/2

This report covers the development and testing of feasibility models of a family of inherently digital fiber optic status-monitoring sensors which sense liquid level, linear displacement, fluid flow rate, strain, pressure and temperature as well as count physical events. In all cases, the sensors are electrically passive. All excitation is in the form of optical power supplied via fiber optics. All response signals are in the form of optical power transmitted via fiber optics. All response signals are inherently digital, i.e. they do not employ analog/digital conversion. Design considerations, performance data and recommendations for further investigation are included. Optical fibers, because of their very small geometry, offer a whole new approach to the precise sensing of small changes in various physical parameters. Sensors employing fiber optics enjoy the many inherent advantages of fiber optics, which include interference immunity, resistance to environmental conditions, small physical size and light weight. Digital fiber optic sensors are a natural adjunct to digital data systems for the above reasons and because no analog/digital conversion is required. Author (GRA)

N79-13860# Massachusetts Inst. of Tech., Cambridge. Crystal Physics and Electronics Lab.

FLUORIDE CRYSTALS FOR HIGH PEAK POWER LASER WINDOW COATINGS Final Technical Report, 17 Feb. 1977 - 30 Nov. 1977

D. J. Epstein, A. Linz, D. R. Gabbe, and N. Rhodes Jun. 1978 66 p refs

(Contract F19628-77-C-0070; AF Proj. 3326)

(AD-A059226; RADC-TR-78-141) Avail: NTIS HC A03/MF A01 CSCL 20/6

The development of high power lasers operating in the infrared has generated a need for improved window coating materials. Absorption at the laser wavelengths must be as low as possible to minimize heating and concomitant damage. Residual impurities in optical materials give rise to absorption bands and also raise the nonspecific infrared absorption above the intrinsic level. GRA

N79-13861# Naval Ocean Systems Center, San Diego, Calif.

MANUFACTURING TECHNOLOGY FOR FIBER OPTIC BUNDLE CABLING Technical Report, Dec. 1975 - Feb. 1978

G. M. Holma and R. A. Greenwell 10 Jul. 1978 58 p

(AD-A058954; NOSC/TR-274) Avail: NTIS HC A04/MF A01 CSCL 20/6

A manufacturing process was developed for the cabling of bundle optical fibers for use on aircraft. The process produces ruggedized optical fiber in large quantities, achieves production cost reduction, and meets the environmental requirements for military aircraft. Specifications for the process are given. Author (GRA)

N79-13862# General Electric Co., Syracuse, N.Y. Optoelectronic Systems Operation.
DEVELOPMENT OF InSb CID ARRAY TECHNOLOGY Final Report, May 1977 - Feb. 1978
W. E. Davern Jul. 1978 58 p
(Contract N00173-77-C-0241; XF54583003)
(AD-A059038) Avail: NTIS HC A04/MF A01 CSCL 17/5

Further improvement on both line and two-dimensional InSb CID arrays has been made. Array performance has been improved by using thinner-gate oxide, thicker field oxide, lower-doping substrate materials, and lower noise amplifier. The co-planar two-dimensional array structure also has been further improved. Array performance efficiencies, (which include transfer, quantum and readout efficiencies) of over 30%, and transfer efficiencies of over 98% have been measured on two dimensional arrays. Effort on a low-noise preamplifier has been carried out and performance of the JFET preamplifier is much better than that of the MOSFET. The NETD for a line array was found to be about 0.1K using a JFET preamplifier and 0.5K using a MOSFET. The measurement was made with a narrow spectral filter of 3.6 to 4.0 micrometers, f/3.25 lens system, and a 500 microsecond integration time. Author (GRA)

N79-13863# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
SPECKLE AND SPECULAR EFFECTS IN ACTIVE INFRARED AND SUBMILLIMETER IMAGING SYSTEMS Final Report
Vincent J. Corcoran Jun. 1978 94 p refs
(Contract DAHC15-73-C-0200)
(AD-A058355; AD-E50030; P-1294; IDA/HQ-77-19733) Avail: NTIS HC A05/MF A01 CSCL 17/5

Speckle effects and specular reflections from nondiffuse surfaces affect the ability of active infrared and submillimeter systems to image scenes. These effects and associated problems with respect to recognition and identification of images are investigated in this report. Author (GRA)

N79-13864# Rochester Univ., N. Y. Inst. of Optics.
OPTICAL INTERFERENCE COATINGS FOR THE ULTRAVIOLET Final Progress Report, 1 Aug. 1977 - 31 Jul. 1978
Philip W. Baumeister 31 Jul. 1978 56 p refs
(Contract N00014-77-C-0573)
(AD-A058527) Avail: NTIS HC A04/MF A01 CSCL 11/3

All dielectric multilayer reflectors were constructed with a radiant reflectance R in excess of 99% at a wavelength of 250 nm. The stacks contained the following materials: hafnia, silica, magnesium fluoride, and yttria. Reflectors were also prepared using alternate layers of silica and hafnia. A maximum reflectance in excess of 0.995 was obtained at 355 nm. Spectroreflectometry was used to determine the refractive index versus wavelength of the following optical coating materials: hafnia, yttria, lanthanum sesquioxide, and tantalum pentoxide. All of these materials, with the exception of the latter, are optically transparent to wavelengths as short as 250 nm. Author (GRA)

N79-13865# Columbia Univ., New York. Dept. of Electrical Engineering.
OPTICAL COMMUNICATIONS SYSTEMS: REPORT OF A GRANTEE-USER MEETING Final Report
Jun. 1978 106 p refs Meeting held at New York, 6-7 Jun. 1977 Sponsored by NSF
(PB-285612/8) Avail: NTIS HC A06/MF A01 CSCL 20F

Topics covered in discussions of materials, devices, and detectors include fiber optics, electro-optics, acousto-optics, atmospheric attenuation, glass fibers, coating technology, feedback control, and optical waveguides. Aspects of optical communication systems examined include optical communications and psychophysics, linear filtering of gaussian quantum states with canonical measurements, information processing for stochastic point processes, experimental performance of point process estimators of optical pulse delay, diversity receivers for atmospheric optical communication, low visibility optical communication-devices and techniques for improved performance. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N79-13866 California Univ., Davis.
FOKKER-PLANCK CALCULATIONS OF RUNAWAY PARTICLE EFFECTS IN PLASMAS Ph.D. Thesis
Robert Lawrence Berger 1978 248 p
Avail: Univ. Microfilms Order No. 7822630

A two dimensional, multi-species Fokker-Planck computer code is used to investigate runaway particle phenomena in plasmas to which an external electric field is applied. The conservative form of the Boltzmann-Fokker-Planck equation with electric field term is solved numerically in spherical coordinates by a fully implicit splitting technique. Electron runaway problems for a singly charged plasma are run for the situation where the magnitude of the electric field is less than that of the critical electric field. Calculations show that while certain values of the electric field cause multiply charged ions at all initial velocities to run away to the first stationary state, there are no values of the electric field that cause ions from all initial velocities to run away to the second stationary state. An exact theory is developed for the average force on runaway ions whose velocity vectors lie along theta = 0 in velocity space. Dissert. Abstr.

N79-13867*# Naval Research Lab., Washington, D. C.
EFFECTS OF COLLISIONS ON LEVEL POPULATIONS AND DIELECTRIC RECOMBINATION RATES OF MULTIPLY-CHARGED IONS Interim Report
V. L. Jacobs and J. Davis Apr. 1978 28 p refs
(NASA Order 60404-G)
(NASA-CR-157627; AD-A054934; NRL-MR-3641) Avail: NTIS HC A03/MF A01 CSCL 20/9

A generalization of previously reported statistical theories is developed for determining the excited level populations and the ionization-recombination balance of multiply-charged atomic ions in an optically-thin high-temperature plasma. Account is taken of the most important collisional and radiative processes involving bound and autoionizing levels in three consecutive ionization stages. A set of rate equations is obtained for the population densities of the low-lying levels which contains effective excitation, ionization, and recombination rates describing indirect transitions through the more highly-excited bound and autoionizing levels. The familiar corona model equations for the ground state populations are recovered by making the assumption that all excited states decay by only spontaneous radiative or autoionization processes. When collisional processes become efficient in depopulating the highly-excited levels important in dielectronic recombination, the effective rate of recombination must be described by a collisional-dielectronic recombination coefficient. GRA

N79-13868# California Univ., Los Angeles. Plasma Physics Group.
INTERACTION OF A LOW DENSITY RUNAWAY BEAM WITH CAVITY MODES
G. J. Morales Jun. 1978 65 p refs
(Contract N00014-75-C-0476)
(AD-A058931; PPG-358) Avail: NTIS HC A04/MF A01 CSCL 20/9

An idealized problem is investigated which illustrates the role of wave-particle interactions in the evolution of runaway beams. The model considers the interaction between a weak cold beam, driven by an external static electric field E, and waves quantized by the geometry. The waves may correspond to Gould-Trivelpiece modes fixed by the length of the experimental device, or to the finite Fourier modes encountered in computer simulations. The physics consists of the sweeping of the accelerated beam through the resonance provided by each cavity mode. This process is formulated in analogy with the O'Neil, Winfrey, Malmberg (OWM) problem but using a spatially averaged

description based on the exact energy and momentum conservation laws with the dynamics simplified through a WKB representation of the dispersion relation. This model shows that the beam can be clamped in velocity with the momentum push being transferred to the waves. The model has been extended to the relativistic and multi-mode cases. GRA

N79-13869# Air Force Geophysics Lab., Hanscom AFB, Mass.
A METHOD FOR TREATING THE SHEATH SIZE IN THE LANGMUIR MOTT-SMITH EQUATION
Christopher Sherman 2 Jun. 1978 17 p
(AD-A058961; AFGL-TR-78-0138; AFGL-ERP-635) Avail: NTIS HC A02/MF A01 CSCL 29/9

An argument is presented which justifies the simultaneous use of both the Langmuir Mott-Smith orbit limited, and the diode space charge limited equations for current collection by electrostatic probes. From these two equations the sheath size can be eliminated and the current to a probe obtained for a large range of values of probe potential and Debye length. Numerical solutions are presented for both the spherical and cylindrical cases. Asymptotic properties are considered.
Author (GRA)

N79-13870# Princeton Univ., N. J. Plasma Physics Lab.
PLASMA TRANSPORT IN STOCHASTIC MAGNETIC FIELDS. 2: PRINCIPLES AND PROBLEMS OF TEST ELECTRON TRANSPORT Interim Report
John A. Krommes Jul. 1978 20 p
(Contract F44620-75-C-0037; EY-76-C-02-3073)
(AD-A059271; PPPL-1462; PPL-UC-20 G; AFOSR-78-1340TR) Avail: NTIS HC A02/MF A01 CSCL 20/9

Plasma confinement in toroidal devices may be significantly degraded because of flux surface destruction and consequent stochastic wandering of magnetic lines. In this study a model stochastic differential equation is considered which describes guiding center electron motion in a statistically specified spectrum of turbulent magnetic fluctuations. The fluctuation intensity is assumed to satisfy the Chirikov criterion (resonance overlap) for onset of stochasticity. GRA

N79-13871# General Atomic Co., San Diego, Calif.
PARAMETRIC REQUIREMENTS FOR NONCIRCULAR TOKAMAK COMMERCIAL FUSION PLANTS
R. F. Bourque May 1978 59 p refs
(Contract EY-76-C-03-0167-038)
(GA-A-14876) Avail: NTIS HC A04/MF A01

The fully integrated systems computer program SCOPE is described and used to determine the parameter ranges for the economical operation of equilibrium commercial fusion power plants using noncircular Tokamak reactors. Costs of electricity were used as the critical dependent variable by which the effects of changes in system parameters were observed. Necessary requirements for economical operation are discussed for wall loadings, electric power level, total beta values, duty and cycles, optimum aspect ration, fall wall lifetime, and specific transport scaling. The results are insensitive to density and temperature profiles over wide ranges. DOE

N79-13872# General Atomic Co., San Diego, Calif.
PARAMETRIC REQUIREMENTS FOR NONCIRCULAR TOKAMAK COMMERCIAL FUSION PLANTS
R. F. Bourque Apr. 1978 7 p refs Presented at 3d ANS Topical Meeting on the Technol. of Controlled Nucl. Fusion, Santa Fe, New Mex., 9-11 May 1978
(Contract EY-76-C-03-0167-038; Proj. 3235)
(GA-A-14946; Conf-780508-19) Avail: NTIS HC A02/MF A01

Systems analyses were performed in order to determine the parameter ranges for economic operation of equilibrium commercial fusion power plants using noncircular Tokamak reactors. The results of these studies show that: (1) neutron wall loadings over 2 megawatts per square meter may be unncessary for economic Tokamak operation, (2) electrical power levels beyond 1000 MW(e) are not required and power levels as low as 100 MW(e) may be acceptable, (3) total beta values of 10 to 12 percent are adequate, (4) duty cycles as low as 50 percent have only a small effect on plant economics, and (5) an acceptable first wall lifetime is 15 MW-yr per square meter. DOE

N79-13873# Oak Ridge National Lab., Tenn.
DATA ACQUISITION SYSTEM FOR MEDIUM POWER NEUTRAL BEAM TEST FACILITY
C. R. Jr. Stewart Jun. 1978 14 p refs
(Contract W-7405-eng-26)
(ORNL-TM-6394) Avail: NTIS HC A02/MF A01

The Medium Power Neutral Beam Test Facility at Oak Ridge National Laboratory was constructed in order to develop, test, and condition powerful neutral beam lines for the Princeton Large Torus experiment at Princeton Plasma Physics Laboratory. The data acquisition system for the test stand monitors source performance, beam characteristics, and power deposition profiles to determine if the beam line operating up to its design specifications. The speed of the computer system is utilized to provide near-real-time analysis of experimental data. Analysis of the data is presented as numerical tabulation and graphic display. DOE

N79-13874# Argonne National Lab., Ill.
THIN LOW Z COATINGS FOR PLASMA DEVICES
J. Norem and D. A. Bowers May 1978 31 p refs
(Contract W-31-109-eng-38)
(ANL/FPP/TM-108) Avail: NTIS HC A03/MF A01

Coating the walls of the vacuum chamber with beryllium or some other low Z material was proposed as a possible means of solving the problem of high Z influx into plasmas. An attempt is made to demonstrate that very thin, low Z coatings are compatible with the operation of plasma devices and beneficial to plasma performance. It is determined that the thickness of coating material required is only about 10 monolayers. The properties of these coatings and possible means of in situ application and maintenance are discussed. Injection of solid pellets into the plasma as a direct way of introducing impurities which would ultimately serve as coating material is also discussed. DOE

N79-13875# Los Alamos Scientific Lab., N. Mex.
VOLTAGES IN TOROIDAL PINCH EXPERIMENTS
P. C. T. VanderLean Jun. 1978 15 p refs
(Contract W-7405-eng-36)
(LA-7335-MS) Avail: NTIS HC A02/MF A01

In toroidal experiments, such as Screw Pinches, Belt Pinches, and Reversed Field Pinches, with both toroidal and poloidal magnetic fields, quite complicated E-fields exist. For an appropriate design one should however, know what voltages occur between the various coils, the stabilizing shell, the plasma itself, the pumping stations, and diagnostic equipment. An attempt is made to give a systematic description of the voltages that develop between coils and objects placed inside them. Two types of coils are considered, one without an external return flux, analogous to the toroidal field coil; and one with external return flux, analogous to the poloidal field coil. Possible methods of groundling are discussed. The Appendix describes what voltages are to be expected in the ZT-40 Reversed-field Pinch experiment under construction at the Los Alamos Scientific Laboratory. DOE

N79-13876# Stevens Inst. of Tech., Hoboken, N. J.
INTERACTION OF TEARING MODES
Y. Satya and G. Schmidt May 1978 15 p refs
(Contract EY-76-S-02-3004)
(TID-28591) Avail: NTIS HC A02/MF A01

A fully developed tearing mode modifies the magnetic field profile. The effect of this profile modifcation on linear growth rate of a different tearing mode is investigated. First a simple slab model is investigated analytically. It was found that the local flattening of the field profile drive adjacent modes more unstable by increasing the value of Delta'. The effect of the saturation of the internal kink (m = 1) mode on higher modes is studied. The change in delta for higher m- modes, for a range of profile parameters is numerically evaluated. No significant change in the growth rate is found for realistic profiles. DOE

N79-13877# Oak Ridge National Lab., Tenn. Fusion Energy Div.
SIMPLE MEASURE OF MERIT FOR FUSION FEASIBILITY

J. Rand McNally, Jr. Jul. 1978 20 p refs
(Contract W-7405-eng-26)
(ORNL-TM-6362) Avail: NTIS HC A02/MF A01

A simple merit factor for fusion related experiments is discussed in terms of several fusion goals and compared with past and present experimental achievements. The merit factor is taken to be M = log 10 to the 10th power K, where k is the four-factor fusion formula (f eta epsilon p) and represents the fusion energy multiplication factor defining ignition for k greater than or equal to 1 or M greater than or equal to 10. The value of k can in most present cases be approximated by f, the thermal energy utilization factor, which equals the ratio of the alpha particle fusion power to the thermal power losses from the plasma. For upcoming large Tokamak experiments, such as TFTR, the fast fusion factor epsilon due to beam-plasma reactions may appreciably exceed unity and thus reduce the Tn tau/sub E/requirements for ignition through f. In the past 20 years, M has increased by six units and k or f by 1000000. DOE

N79-13878# Oak Ridge National Lab., Tenn.
EVALUATION OF PULSE COIL ALTERNATIVES FOR THE LARGE COIL PROGRAM
B. E. Nelson Jul. 1978 31 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6197) Avail: NTIS HC A03/MF A01

The large coil program coil test stand is an arrangement of six tokamak toroidal field coils in a compact toroidal geometry. The design of a pulse field coil tailored to this geometry and providing the proper simulation of time-variant fields is the subject of this report. Several pulse coil candidate concepts are evaluated, including: (1) a pair of poloidal coils outside the large Coil Facility (LCTF) torus; (2) a single poloidal coil threaded through the torus; and (3) a pair of vertical axis coil windings inside the bore of the toroidal test coils. The latter configuration was selected for use in the LCTF due to its versatility, ease of fabrication, and lower operating cost. DOE

N79-13879# Oak Ridge National Lab., Tenn.
SIMULATION OF MULTISPECIES IMPURITY TRANSPORT IN TOKAMAKS
T. Amano and E. C. Crume Jun. 1978 35 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6363) Avail: NTIS HC A03/MF A01

To simulate multispecies impurity transport in Tokamaks, a set of coupled continuity equations including source and sink terms from atomic processes (rate terms) were solved numerically. The diffusion and rate terms are integrated separately in time using a fractional step-splitting technique which is accurate to second order in the time step. Calculations were performed treating individually all the ionization stages of oxygen and iron impurities in a hydrogen plasma. Calculated O 6 and O 7 relative density profiles agree qualitatively with profiles measured in the Adiabatic Toroidal Compressor (ATC) Tokamak when purely neoclassical diffusion coefficients are used. DOE

N79-13880# California Univ., Livermore. Lawrence Livermore Lab.
CONCEPTUAL DESIGN OF THE FIELD-REVERSED MIRROR REACTOR
G. A. Carlson, W. C. Condit, R. S. Devoto, J. H. Fink, J. D. Hanson, W. S. Neef, and A. C. Smith, Jr. 19 May 1978 59 p refs
(Contract W-7405-eng-48)
(UCRL-52467) Avail: NTIS HC A04/MF A01

For this reactor a reference case conceptual design was developed in some detail. The parameters of the design result partly from somewhat arbitrary physics assumptions and partly from optimization procedures. A number of possible start-up scenarios for the field-reversed plasmas were considered, but the choice of a specific start-up method for the conceptual design was deferred, pending experimental demonstration of one or more of the schemes in a mirror machine. Basic to the plasma model is the assumption that, once created, the plasma can be stably maintained by injection of a neutral-beam current sufficient to balance the particle-loss rate. The reference design is a multicell configuration with 11 field-reversed toroidal plasma layers arranged along the horizontal axis of a long-superconducting solenoid. Each plasma layer requires the injection of 3.6 MW of 200 keV deuterium and tritium, and produces 20 MW of fusion power. The reactor has a net electric output of 74 MWe. The preliminary estimate for the direct capital cost of the reference design is $1200/kWe. DOE

N79-13881# California Univ., Livermore. Lawrence Livermore Lab.
SOME ESTIMATES OF MIRROR PLASMA STARTUP BY NEUTRAL BEAM HEATING OF PELLET AND GAS CLOUD TARGETS
J. W. Shearer and P. A. Willmann 7 Jul. 1978 36 p refs
(Contract W-7405-eng-48)
(UCID-17845) Avail: NTIS HC A03/MF A01

Hot plasma buildup by neutral beam injection into an initially cold solid or gaseous target is found to be conceivable in large mirror machine experiments such as 2XIIB or MFTF. A simple analysis shows that existing neutral beam intensities are sufficient to ablate suitable targets to form a gas or vapor cloud. An approximate rate equation model is used to follow the subsequent processes of ionization, heating, and hot plasma formation. Solutions of these rate equations are obtained by means of the 'GEAR' techniques for solving 'stiff' systems of differential equations. These solutions are in rough agreement with the 2XIIB stream plasma buildup experiment. They also predict that buildup on a suitable nitrogen-like target will occur in the MFTF geometry. In 2XIIB the solutions are marginal; buildup may be possible, but is not certain. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N79-13882 Princeton Univ., N. J.
VIBRATIONS OF RECTANGULAR CRYSTAL PLATES COATED WITH MULTIPLE STRIP ELECTRODE PLATINGS Ph.D. Thesis
Charles Zee 1978 161 p
Avail: Univ. Microfilms Order No. 7823528

The two dimensional equations of motion were modified to incorporate the effect of platings on an AT-cut quartz plate. By comparing with the three dimensional theory, three correction factors are introduced to correct the shearing motions in the x sub and x sub 3, the directions, and the stretching motion along the thickness of the plate. These together with the unplated equations of motion of an AT-cut quartz are combined to describe the motion of an elastically coupled piezoelectric resonator system. Dissert. Abstr.

N79-13883 Stanford Univ., Calif.
MONTE CARLO STUDIES OF BINARY MICROCLUSTERS, CRYSTAL/AMORPHOUS INTERFACES AND SURFACE SEGREGATION Ph.D. Thesis
Nan-Hsiung Tsai 1978 121 p
Avail: Univ. Microfilms Order No. 7822585

The Metropolis Monte Carlo method of statistical mechanics is a simple but powerful research tool to simulate in detail a broad spectrum of structure and thermodynamic properties associated with the complex behavior of a many-body and/or multispecies system where only the intermolecular potential functions need be specified. Three subjects on material science are studied by using this method, namely: the thermodynamics and structures of binary microclusters, the thermodynamics and structure of crystal/amorphous interfaces and surface segregation. In these simulations, the appropriate Lennard-Jones potentials are used to calculate the internal energy. Dissert. Abstr.

N79-13884 Minnesota Univ., Minneapolis.
THE EFFECT OF NON-STOICHIOMETRY ON THE ACOUSTICAL VELOCITY AND ELECTRON SPIN RESONANCE OF BARIUM-OXIDE SINGLE CRYSTALS Ph.D. Thesis
Kwang Oh Park 1977 211 p
Avail: Univ. Microfilms Order No. 7823947

The effects of nonstoichiometric excess oxygen on the mode of formation and the nature of defects formed in BaO single

crystals were studied by measuring the changes of elastic constants, electron spin resonance, and infrared absorption in the O-H stretching mode frequency region. For the reference state, these properties were measured for annealed BaO crystals. In addition to these, the thermal expansivity of BaO was also measured down to 20 K. Dissert. Abstr.

N79-13885 Michigan Univ., Ann Arbor.
THE EFFECT OF MIXED TUNNELING AND AVALANCHE BREAKDOWN ON MICROWAVE TRANSIT-TIME DIODES Ph.D. Thesis
Michael Ebel Elta 1978 211 p
Avail: Univ. Microfilms Order No. 7822892

Analytical equations, circuit models, and computer simulations are used to determine dc, small signal, and large signal behavior. Analytical models of dc and small signal characteristics for Read-type diode structures are given which incorporate both tunneling and avalanche mechanisms. An analytical method is developed to calculate an effective ionization rate. The effective ionization rate together with a modified Read equation for the generation region are used to calculate the large signal conduction current density in the generation region. A large signal computer simulation is developed. Large signal results were obtained for both a series of X-band Read-type structures and a series of quasiuniform structures for both Si and GaAs. Dissert. Abstr.

N79-13886*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IONIZED DOPANT CONCENTRATIONS AT THE HEAVILY DOPED SURFACE OF A SILICON SOLAR CELL
Irving Weinberg, Jacob D. Broder, George A. Mazaris, Jr., and Lan Hsu Dec. 1978 19 p refs
(Grant NsG-3014)
(NASA-TP-1347; E-9629) Avail: NTIS HC A02/MF A01 CSCL 10B

Data are combined with concentrations obtained by a bulk measurement method using successive layer removal with measurements of Hall effect and resistivity. From the MOS (metal-oxide-semiconductor) measurements it is found that the ionized dopant concentration N has the value (1.4 + or - 0.1) x 10 to the 20th power/cu cm at distances between 100 and 220 nm from the n(+) surface. The bulk measurement technique yields average values of N over layers whose thickness is 2000 nm. Results show that, at the higher concentrations encountered at the n(+) surface, the MOS C-V technique, when combined with a bulk measurement method, can be used to evaluate the effects of materials preparation methodologies on the surface and near surface concentrations of silicon cells.
Author

N79-13887# California Inst. of Tech., Pasadena. Dept. of Electrical Engineering.
ANALYSIS OF SEMICONDUCTOR STRUCTURES BY NUCLEAR AND ELECTRICAL TECHNIQUES Final Technical Report
Marc-A. Nicolet and James W. Mayer Griffiss AFB, New York RADC Jun. 1978 25 p refs
(Contract F19628-75-C-0008; AF Proj. 2305)
(AD-A058772; RADC-TR-78-145) Avail: NTIS HC A02/MF A01 CSCL 20/12

This report summarizes the results obtained under a contract from 1974 to 1977, focusing on silicide formation of thin metal films on a Si substrate. The main thrust of the effort was directed at: (1) Development of the data base on thin-film silicide formation, and the investigation of the influence of the Si substrate on the silicide formation. When taken in context with results of other studies, the data obtained exhibit a clear pattern of behavior among the various metal films, but the detailed picture appears to be complex; (2) Development of marker experiments by ion-implanted Ar or Xe markers; (3) Clarification of the role played by oxygen contamination in silicide formation; (4) Stability of silicide layers; (5) Reaction of metal layers with SiO2; (6) Electrical characteristics of Pd2Si; and (7) A computer program was written to synthesize backscattering spectra for thin-film samples composed of successive layers of uniform thickness and composition. GRA

N79-13888# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Electrical Engineering.
DESIGN, ERROR ANALYSIS AND OPERATION OF A NOISE AUTOCORRELATOR Interim Report
Michael J. McNutt and C. T. Sah Griffiss AFB, N.Y. RADC May 1978 47 p refs
(Contract F19628-77-C-0138; AF Proj. 2306)
(AD-A058857; RADC-TR-78-114; SR-2; TR-34) Avail: NTIS HC A03/MF A01 CSCL 09/4

Low frequency 1/f noise limits the ultimate sensitivity of semiconductor devices such as MOSFET (MOS Field-Effect-Transistor) and CCD (Charge Coupled Devices). The study of the origin of the low frequency noise sources requires detailed measurements of the noise power spectra under a wide range of device operating conditions. This report details the design and operation of a hardwired noise correlation processor (correlator) which is interfaced to a host computer for two-way handshaking operation. The correlator samples the noise voltage from a device under study as well as calculates, averages and stores the autocorrelation function of the noise. The host computer can then sample the autocorrelation data, calculate the power spectrum and plot the results, all on a low priority time sharing basis if necessary. This system provides the flexibility of programmable control and the speed and accuracy of dedicated hardware correlator. In order to optimize the correlator design, a detailed analysis of sampling, correlation and noise theory were undertaken which provided some important insights on sampling quantization errors, and noise power averaging techniques using incomplete correlation. These theoretical concepts apply to a wide range of situations of signal correlation, as well as noise power spectra measurements on silicon semiconductor devices.
Author (GRA)

N79-13889# Texas Instruments, Inc., Dallas. Central Research Labs.
GALLIUM ARSENIDE MATERIALS GROWTH AND PROCESSING Final Scientific Report
D. W. Shaw Jun. 1978 15 p refs
(Contract F44620-75-C-0036)
(AD-A059017; AFOSR-78-1170TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

Continuous, in situ rate measurements were employed to evaluate the influence of gas phase supersaturation on the gallium arsenide epitaxial growth kinetics relative to the extent of heterogeneous nucleation and extraneous deposition on fused silica. The resulting kinetic data permit establishment of the optimum conditions for selective epitaxial growth of gallium arsenide at subnormal temperatures using the classic gallium/arsenic trichloride/hydrogen chemical vapor deposition process. Specifically, the extent of extraneous deposition is minimized through the use of low arsenic partial pressures entering the source region or through the use of small source surface areas.
GRA

N79-13890# Naval Academy, Annapolis, Md.
RADIATION INDUCED DIELECTRIC RELAXATION IN RARE-EARTH DOPED CALCIUM FLUORIDE Final Report, 1977-1978
Greg C. Kolodziejczak 25 May 1978 68 p refs
(AD-A058677; USNA-TSPR-93) Avail: NTIS HC A04/MF A01 CSCL 20/2

Low frequency dielectric properties of rare-earth doped calcium fluoride crystals were studied over a temperature range of 5.5 K to 380 K. Low flux neutron radiation was found to have no effect. Gamma rays, on the other hand, were found to significantly effect these properties. Experiment, in details, is discussed in the paper. The results support the hypothesis that R sub 1 is from isolated dipoles, R sub 2 is from simple clusters, and R sub 3, R sub 4 and R sub 5 are from more complex clusters. The possible use of dielectrics in dosimetry also is discussed. Author (GRA)

N79-13891# California Inst. of Tech., Pasadena.
DETERMINATION OF MICROSCOPIC ATOMIC STRUCTURE OF SURFACES AND OVER LAYERS WHICH ARE IMPORTANT IN HETEROGENEOUS CATALYSIS Final Report, 15 Jun. 1975 - 14 Jun. 1978
W. Henry Weinberg Aug. 1978 23 p refs

(Grants DAHC04-75-G-0170; DAAG29-75-G-0170)
(AD-A058446; ARO-13120.1-C) Avail: NTIS HC A02/MF A01 CSCL 20/12

This report describes the research efforts in five different areas, all related to a better understanding of solid surfaces: (1) The analysis of surface structures by low-energy electron diffraction (LEED); (2) Other research related to LEED such as an improved method of measuring experimentally the angle of incidence of the electron beam in a LEED apparatus; (3) An examination of desorption phenomena including a theoretical treatment of thermal desorption mass spectrometry (TDS); (4) Model calculations concerning the dependence of the spectral intensity upon adsorbate concentration in inelastic electron tunneling spectroscopy (IETS); and (5) Chemisorption and surface reactions. Author (GRA)

N79-13892# IBM Watson Research Center, Yorktown Heights, N.Y.
ELECTRONIC STRUCTURE AND PROPERTIES OF THE OXIDES OF THE TETRAHEDRAL SEMICONDUCTORS AND THEIR INTERFACES Final Report, 1 Jun. 1976 - 31 May 1978
Sokrates T. Pantelides 31 Jul. 1978 145 p refs
(Contract N00014-76-C-0934)
(AD-A058426) Avail: NTIS HC A07/MF A01 CSCL 20/12

A simple but general model is developed in which the electronic structure and spectra of SiO2, GeO2 and the ABO4-type oxides are studied in a systematic way. Methods have also been developed in terms of which are calculated the energy levels of impurities in bulk SiO2 and at the Si-SiO2 interface, and the electronic structure of free surfaces and interfaces between crystalline materials. The main objectives of the work reported here were to obtain a theoretical description of the electronic structure and properties of the oxides of the tetrahedral semiconductors (in particular, SiO2, GeO2, and the ABO4-type oxides, where AB is a tetrahedral semiconductor) and their interfaces with other materials and vacuum. GRA

N79-13893# Colorado State Univ., Fort Collins. Dept. of Physics.
MICROWAVE RELAXATION AND MICROSTRUCTURE IN POLYCRYSTALLINE FERRITES Final Report, 1 Sep. 1974 - 30 Sep. 1977
Carl E. Patton and Geoffrey O. White 28 Feb. 1978 141 p refs
(Grant DAHC04-75-G-0010)
(AD-A058652; ARO-12240.3-EL) Avail: NTIS HC A07/MF A01 CSCL 20/2

The relationship between microstructure and microwave loss in polycrystalline ferrites has been investigated. Two classes of materials were used, polycrystalline yttrium iron garnet (YIG) with a systematic variation in porosity and grain size and arc-plasma-sprayed Li-Ti ferrite. Data include magnetization versus field at room temperature, near-resonance and off-resonance effective linewidth as functions of temperature from 100 K to 300 K at 10 GHz, and parallel pump spin-wave linewidth as a function of wave-number at 9 GHz, for temperatures from 90 K to 370 K. The data indicate that neither the transit-time nor the magnetostriction mechanism are reasonable sources of the intrinsic microwave losses in polycrystals. The YIG effective linewidth data suggest the importance of small second phase content, possibly in the grain boundaries, with a Curie temperature on the order of 300 K. The YIG high power data indicate that the mechanism(s) controlling the spin-wave linewidth are quite different from those limiting the effective linewidth. Significant increases in spin-wave linewidth occur at low temperature, while the effective linewidth is relatively constant at low temperature. The data on the Li-ferrite materials prepared by the arc-plasma-spraying process indicate that this novel process is potentially of great value in the production of practical materials for radar applications. GRA

N79-13894# Naval Surface Weapons Center, White Oak, Md.
LOW TEMPERATURE MAGNETIZATION AND MAGNETOSTRICTION OF SINGLE CRYSTAL TmFe2
R. Abbundi and A. E. Clark 17 Jul. 1978 10 p refs
(AD-A058735; NSWC/WOL/TR-78-121) Avail: NTIS HC A02/MF A01 CSCL 20/2

The magnetization and magnetostriction of single crystal TmFe2 were measured as a function of temperature from 4K to 300K. TmFe2, because of its highly anisotropic 4f charge distribution, displays a huge magnetocrystalline anisotropy and magnetostriction at cryogenic temperatures. The anisotropy spans the range from -530000 erg/cc at room temperature to the extrapolated value of 15 x 10 to the 8th power erg/cc at 0 K. The saturated magnetic moment was found to be 74 emu/g, which is substantially larger than previous polycrystalline results. The temperature dependence of the magnetostriction closely follows single-ion magnetoelastic theory. GRA

N79-13895# Oak Ridge National Lab., Tenn.
REFLECTORS, INFINITE CYLINDERS, INTERSECTING CYLINDERS AND CRITICALITY
J. T. Thomas Jul. 1978 47 p refs
(Contract W-7405-eng-26)
(ORNL/CSD/TM-57) Avail: NTIS HC A03/MF A01

Calculations of the effective neutron multiplication factor of critical and subcritical infinitely long cylinders of aqueous solutions of fissile materials for various configurations of water and concrete reflectors are presented. The results provide a basis for investigating the criticality of intersecting pipes with similar reflectors. An infinitely long central cylinder with up to four intersections within each 0.46 m increment of length was examined. A method for evaluating the nuclear criticality safety of these configurations is given and a margin of subcriticality recommended. DOE

N79-13896# Westinghouse Electric Corp., Pittsburgh, Pa. Dept. of Fusion Power Systems.
EFFECT OF VOID MALDISTRIBUTION ON THE CRYOGENIC RECOVERY CAPABILITY OF MULTIFILAMENTARY AND CABLED SUPERCONDUCTORS
A. Y. Lee 1977 5 p refs
(Contract W-7405-eng-26)
(TID-28513) Avail: NTIS HC A02/MF A01

Comprehensive cryogenic stability analyses of the superconductors which are cooled by forced flow single phase liquid helium have been carried out. In these analyses the cryogenic recovery capability of a conductor design was analyzed to determine from what initially imposed normal state temperature the conductor can recover its superconductivity as a function of the available cooling capacity, after the occurrence of an event in which a given amount of heat is deposited suddenly to the conductor, driving the superconductor to a normal state. DOE

N79-13897# Vermont Univ., Burlington. Dept. of Physics.
CONTRIBUTION TO THE THEORY OF SUPERCONDUCTIVITY IN PALLADIUM DEUTERIDE Progress Report, 1 Apr. 1977 - 31 Mar. 1978
J. S. Brown and A. H. M. Lopez-Escobar 1978 10 p refs
(COO-3551-45) Avail: NTIS HC A02/MF A01

It is shown that if electronic screening is included in the calculation of the electron-phonon parameter lambda for stoichiometric PdD, the correct experimental value of the superconducting transition temperature T/sub c/ can be obtained without any adjustment of the Coulomb pseudopotential. DOE

N79-13898# National Technical Information Service, Springfield, Va.
JOSEPHSON JUNCTIONS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Aug. 1978
George W. Reimherr Oct. 1978 204 p Supersedes NTIS/PS-77/0841; NTIS/PS-76/0744; NTIS/PS-75/590 (NTIS/PS-78/1047/6; NTIS/PS-77/0841; NTIS/PS-76/0744; NTIS/PS-75/590) Avail: NTIS HC $28.00/MF $28.00 CSCL 20L

The citied reports of Federally-funded research discuss theory, design, fabrication, performance and applications of josephson junctions. References to such applications as far infrared radiation detectors, microwave detectors, voltage standards, noise thermometry, and magnetometry are included. This updated bibliography contains 199 abstracts, 18 of 20 which are new entries to the previous edition. GRA

N79-13899# National Technical Information Service, Springfield, Va.
JOSEPHSON JUNCTIONS, VOLUME 2. CITATIONS FROM

THE ENGINEERING INDEX DATA BASE Progress Report, 1975 - Aug. 1978
George W. Reimherr Oct. 1978 300 p Supersedes NTIS/PS-77/0842; NTIS/PS-76/0746
(NTIS/PS-78/1048/4; NTIS/PS-77/0842) Avail: NTIS HC $28.00/MF $28.00 CSCL 20L

The cited worldwide reports discuss research concerning the theory, design, fabrication, performance, and applications of Josephson junctions. References to such applications as logic circuits, shift registers, data storage devices, far infrared detectors, microwave detectors, voltage standards, noise thermometry, and magnetometry are included. This updated bibliography contains 232 abstracts, 86 of which are new entries to the previous edition. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N79-13900 Denver Univ., Colo.
STATISTICAL INFERENCE IN QUANTUM MECHANICS Ph.D. Thesis
Rodney Warren Benoist 1978 94 p
Avail: Univ. Microfilms Order No. 7823786

A procedure is developed to determine the most likely state of a quantum system about which only partial information is available (statistical inference). The partial information consists of: (1) macroscopic a priori information (e.g., the temperature of the system); and (2) microscopic measurement of some, but not all, observables (e.g., position). The solution rests upon the mathematical theory of non-commutative probability. The present formalism is distinguished from previous attempts (coarse-graining) in that it considers arbitrary a priori states and thereby gains in generality and applicability. The method is also applied to the general problem of quantum-mechanical measurement, and an alternate interpretation of the phenomenon of reduction of states is offered. Dissert. Abstr.

N79-13901*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROTHERMAL TESTS OF A HEAT-PIPE-COOLED LEADING EDGE AT MACH 7
Charles J. Camarda Nov. 1978 39 p refs
(NASA-TP-1320; L-12302) Avail: NTIS HC A03/MF A01 CSCL 20N

A sodium-filled, Hastelloy X, heat-pipe-cooled leading-edge model, which had previously been tested in a radiant-heating environment, was subjected to steady-state, Earth-entry aerothermal loads (heat and pressure) in the Langley 8-foot high-temperature structures tunnel to verify performance in a realistic hypersonic environment. The model was tested at angles of attack of 0 deg, 10 deg, and 20 deg, angles of roll of 0 deg and 90 deg, calculated stagnation heating rates ranging from 244 to 422 kW/sq m (21.5 to 37.2 Btu/sq ft-s), and nominal stagnation pressures of about 50 and 124 kPa (7.3 and 18 psia). Experimental results were in good agreement with analytical results and indicated that heat pipes could accommodate very intense localized heating and effectively isothermalize structural components. Specifically, results of the tests indicate that the use of heat pipes for leading-edge cooling was a feasible method for lowering localized stagnation temperatures of hypersonic cruise vehicles and space transportation system vehicles sufficiently to allow the use of available and durable superalloys for such applications. Author

N79-13902# Center for Naval Analyses, Arlington, Va.
UNIFORM TREATMENT OF FLUCTUATION AT CRITICAL POINTS
Marc Mangel May 1978 55 p refs
(AD-A058539; CNA-PP-227) Avail: NTIS HC A04/MF A01 CSCL 20/13

A generalized critical point is characterized by the vanishing of certain linear relationships. In particular, the dynamics near such a point are completely nonlinear. This paper analyzes fluctuations at such points of spatially homogeneous systems. Thermodynamic critical points are discussed as a special case; but the main emphasis is on stochastic kinetic equations. Fluctuations at a critical point cannot be characterized by a Gaussian density, but more sophisticated densities yield reasonable results. The theory is applied to the critical harmonic oscillator. GRA

N79-13903# Center for Naval Analyses, Arlington, Va.
RELAXATION CRITICAL POINTS: DETERMINISTIC AND STOCHASTIC THEORY
Marc Mangel Jun. 1978 67 p
(AD-A058540; CNA-PP-228) Avail: NTIS HC A04/MF A01 CSCL 20/13

A generalized critical point is characterized by totally non-linear dynamics. The deterministic and stochastic theory of relaxation is formulated at such a point. Canonical problems are used to motivate the general solutions. In the deterministic theory, at the critical point certain modes have polynomial (rather than exponential) growth or decay. The stochastic relaxation rates can be calculated in terms of various incomplete special functions. Three examples are considered. First, a substrate inhibited reaction (marginal type dynamical system). Second, the relaxation of a mean field ferromagnet. A result is obtained that generalizes the work of Griffiths et al. Third, the relaxation of a critical harmonic oscillator, is considered. GRA

N79-13904# Texas Univ., Austin. Center for Particle Theory.
GRAVITY AND SUPERGRAVITY AS GAUGE THEORIES ON A GROUP MANIFOLD
Y. Neeman and T. Regge [1978] 11 p refs Sponsored in part by NSF and US-Israel Binational Foundation Prepared in cooperation with Inst. for Advanced Study, Princeton, N. J.
(Contract EY-76-S-05-3992)
(ORO-3992-333) Avail: NTIS HC A02/MF A01

Generalizations of gravity, including supergravity are constructed by writing the theory on the group manifold (Pioncare for gravity, the graded-Poincare group for supergravity). The action involves forms over the group, restricted to a 4-dimensional submanifold. The equations of motion produce a Lorentz-gauge in gravity and supergravity, and an additional anholonomic supersymmetric coordinate transformation which reduces to the 'local supersymmetry' of supergravity. DOE

N79-13905# Texas Univ., Austin.
GAUGE THEORY OF GRAVITY AND SUPERGRAVITY ON A GROUP MANIFOLD
Y. Neeman and T. Regge Dec. 1977 84 p refs Prepared in cooperation with the Inst. for Advanced Study, Princeton, N. J.
(Contract EY-76-S-05-3992)
(ORO-3992-328) Avail: NTIS HC A05/MF A01

The natural arena for the physics of gravity, supergravity, and their enlargements appears to be the group manifold of the Poincare group P, the graded Poincare group GP of supersymmetry, and the corresponding enlargements. The dynamics of these theories correspond to geometrical algorithms in P and GP. Differential geometry on Lie groups is reviewed and results applied to P and GP. Curvature, gauge transformations, and factorization are introduced. Also reviewed is the general coordinate transformation group and a hybrid gauge transformation, the anholonomized G.C.T. guage. A study is made of the construction of an action, including the introduction of a set of special 2 forms, the pseudo curvatures. The possibilities of factorization in supersymmetry are analyzed. The version of supergravity is present which has now become a completely geometrical theory. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N79-13906* National Aeronautics and Space Administration, Washington, D. C.
HIGHLIGHTS OF 1978 ACTIVITIES
26 Dec. 1978 18 p
(NASA-News-Release-78-190; P78-10196) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 05A

General highlights of NASA's activities for 1978 are presented. The highlights are categorized into topics such as space science, space transportation systems, space and terrestrial applications, environment, technology utilization, aeronautics, space research and technology, energy programs, and international. A list of the 1978 launches including: (1) launch date; (2) payload designation; (3) launch vehicle; (4) launch site and (5) mission remarks is also presented. G.Y.

N79-13907# Michigan Univ., Ann Arbor. Inst. for Social Research.
FUTURE PERFORMANCE TREND INDICATORS: A CURRENT VALUE APPROACH TO HUMAN RESOURCES ACCOUNTING. REPORT 6: UTILIZATION PROBLEMS TIED TO METHODOLOGICAL ISSUES
David G. Bowers and Alan S. Davenport Aug. 1978 57 p refs
(Contract N00014-76-C-0362)
(AD-A058831; Rept-6) Avail: NTIS HC A04/MF A01 CSCL 05/9

This report discusses theoretical issues and methodological concerns relating to the implementation of a Current Value Approach to Human Resource Accounting. The topics presented include: reliability, validity of predictors and criterion, limits on variance available for predictions, transformation of data, non-dollar metrics, unit of analysis and subsetting of organizational members, consistency of predictor-criterion relationships across time and function, multicolinearity, number of predictor variables, and patterns of change. Suggestions for solutions to implementation problems are given, as are recommendations for additional areas of investigation into theoretical and utilization issues.
Author (GRA)

N79-13908# Air Force Human Resources Lab., Brooks AFB, Tex.
HIER-GRP: A COMPUTER PROGRAM FOR THE HIERARCHICAL GROUPING OF REGRESSION EQUATIONS Final Report
C. Deene Gott Jun. 1978 70 p refs
(AF Proj. 6323)
(AD-A058415; AFHRL-TR-78-14) Avail: NTIS HC A04/MF A01 CSCL 05/1

This report describes the technical details required for using the HIER-GRP computer program as it is currently operational on the Univac 1108. HIER-GRP (or one of the earlier versions of the program) has been used in the past, especially in conjunction with 'policy-capturing applications,' and many of those applications are referenced herein. The report contains a discussion of the basic algorithm, an outline of the essential steps, specifications of the computer system requirements, descriptions of necessary control cards, and explanations of the program output. Also, appendices are included that contain the mathematical formulas used, some mathematical background helpful for understanding the algorithm, sample output, and a complete source card listing. GRA

N79-13909# Decisions and Designs, Inc., McLean, Va.
ADVANCED DECISION TECHNOLOGY PROGRAM Annual Progress Report, 1 Oct. 1976 - 30 Sep. 1977
30 Dec. 1977 60 p refs Prepared in cooperation with Perceptronics, Inc., Woodland Hills, Calif.; Harvard Univ., Cambridge, Mass.; Stanford Univ. and Univ. of Southern Calif., University Park
(Contract N00014-76-C-0074)
(AD-A058478; PR-77-12-30) Avail: NTIS HC A04/MF A01 CSCL 05/1

This report presents a review of salient progress and accomplishments achieved in the ARPA-supported Advanced Decision Technology Program during Fiscal Year 1977. The research highlighted is concerned with a variety of technical questions fundamental to the development and refinement of utilitarian decision aids. Applied research activities conducted under the research program concerned with the application of the variety of decision aiding concepts to DOD decision problems are also reviewed. Author (GRA)

N79-13910# National Technical Information Service, Springfield, Va.
MANAGEMENT INFORMATION SYSTEMS, VOLUME 1: A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Oct. 1977
Carolyn Shonyo Oct. 1978 294 p
(NTIS/PS-78/1068/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 05B

Although many applications of management information systems are discussed, the bulk of the research has major applications to Medicaid, health care, medical information systems, and logistics management. Research on information systems used in decision making is included. This updated bibliography contains 289 abstracts, none of which are new entries to the previous edition. GRA

N79-13911# National Technical Information Service, Springfield, Va.
MANAGEMENT INFORMATION SYSTEMS, VOLUME 2: A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1977 - Sep. 1978
Carolyn Shonyo Oct. 1978 84 p Supersedes NTIS/PS-77/0918; NTIS/PS-76/0779; NTIS/PS-75/601
(NTIS/PS-78/1069/0; NTIS/PS-77/0918; NTIS/PS-76/0779; NTIS/PS-75/601) Avail: NTIS HC $28.00/MF $28.00 CSCL 05B

Although many applications of management information systems are discussed, the bulk of the research has major applications to Medicaid, health care, medical information systems, and logistic management. Research on information systems used in decision making is included. This updated bibliography contains 79 abstracts, all of which are new entries to the previous edition. GRA

N79-13912# CONSAD Research Corp., Pittsburgh, Pa.
DESIGN AND PILOT TESTING OF A UTILIZATION TRACKING METHODOLOGY Final Report
31 Jan. 1978 291 p refs
(Contract NSF C-76-11438)
(PB-284640/0; NSF/RA-780057) Avail: NTIS HC A13/MF A01 CSCL 05A

A data acquisition system, the utilization tracking system, was developed and pilot tested to facilitate the development of an acceptable long-range utilization assessment program. The fully operational system of this type would maintain: (1)continuing, repeated surveys of principal investigators and program managers; (2)continuing repeated surveys of designated users of projects research results;(3) snowball expansion of the samples of prospective users; and (4) development of analytic techniques to exploit the information obtained in these surveys. In addition to serving the important immediate purpose of providing the basis for the estimation of current levels of utilization of individual research projects, the preceeding data acquisition capabilities will facilitate an enhanced understanding of the dynamics of the diffusion, adoption, and utilization of the product of projects funded by NSF/RANN. GRA

N79-13913# National Academy of Sciences - National Research Council, Washington, D. C. Ad Hoc Steering Committee for the Study of Research Applied to National Needs.
STRATEGIES FOR APPLIED RESEARCH MANAGEMENT
1978 124 p refs
(Contract NSF C-310)
(PB-284741/6; NSF/RA-780088) Avail: NTIS HC A06/MF A01 CSCL 05A

A product of interviews, deliberations, reviews, and a workshop--all dedicated to the identification of alternate, workable

management strategies for the effective use of RANN research results is reported. The study was conducted through interviews and discussions with the respective division directors, personnel of other agencies, representatives of participating governmental units, universities and/or industrial firms, and even with representatives of withdrawn unsuccessful bidders. The four case study areas were: the delivery of public services to remote areas via telecommunications technology; the solar heating and cooling of buildings; trace contaminants in the environment from agricultural, mining, and manufacturing activities; and industrial productivity (automation). GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N79-13914* National Aeronautics and Space Administration, Washington, D. C.

NASA GUIDELINES ON REPORT LITERATURE

1978 27 p refs

(NASA-SP-7200) Avail: NTIS HC A03 CSCL 05B

NASA seeks for inclusion in its Scientific and Technical Information System research reports, conference proceedings, meeting papers, monographs, and doctoral and post graduate theses which relate to the NASA mission and objectives. Topics of interest to NASA are presented. G.Y.

N79-13915*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

FY 1978 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS, AND PRESENTATIONS

O. L. White, comp. Oct. 1978 79 p refs

(NASA-TM-78203) Avail: NTIS HC A05/MF A01 CSCL 05B

Abstracts of 73 technical papers published or presented by MSFC personnel in FY-78 are presented. In addition, over 400 papers by contractors to that facility are listed along with the STAR document number for each report. Titles of 208 additional papers already cleared for publication are included. A.R.H.

N79-13916# Massachusetts Inst. of Tech., Cambridge. Dept. of Mathematics.

THE IDENTIFICATION OF AN ELEMENT OF A LARGE POPULATION IN THE PRESENCE OF NOISE

Herman Chernoff 31 Jul. 1978 68 p refs

(Contract N00014-75-C-0555)

(AD-A059070; TR-12) Avail: NTIS HC A04/MF A01 CSCL 09/2

A new approach is presented to the problem of determining whether an individual (the target) appears in a large file where individuals are identified by measurements subject to error. This approach attaches costs to searching and to missing the individual. It corresponds to testing a simple hypothesis, that the measurements on the target and an element in the library have a given joint distribution, against the alternative that they are independent. Certain measures of information from large deviation theory are relevant. There is a surprising reduction in effectiveness of information in the presence of error. Data compression issues are studied. Attention is paid to a two-stage search procedure where the file is subdivided into piles which are in turn subdivided into bins. Each pile is examined and either discarded or searched. If it is searched, each bin in it is examined and either discarded or searched. If a bin is searched, each element of the bin is compared with the target. Author (GRA)

N79-13917# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

SYSTEM SURVEY WITH A VIEW TOWARD UTILIZING A BLACK-END DATA BASE PROCESSOR M.S. Thesis

Lester Emil Nagel Mar. 1978 104 p refs

(AD-A058513; AFIT/GCS/EE/78-5) Avail: NTIS HC A06/MF A01 CSCL 05/1

Members of the Air Force Military Personnel Center (AFMPC) want to investigate the feasibility of utilizing a back-end data base processor system configuration for the AFMPC personnel data management system. This thesis surveys the current system, the personnel management organization (AFMPC), the back-end data base processor concept, and the general requirements of the system. The basic problems of the current system are that it is heavily utilized, and the data base files cannot be updated on a timely basis because of the heavy workload. The back-end data base processor concept is relatively new and may provide a solution to these problems. Consequently, a discussion of the back-end concept, its advantages, and disadvantages is presented. In addition, the general requirements of the system are discussed and are divided into two categories; functional requirements, and system requirements. GRA

N79-13918# California Univ., Los Angeles. Graduate School of Management.

LONG RANGE INFORMATION SERVICES PLANNING: A METHODOLOGY

Bennet P. Lienz and Myles Chen Aug. 1978 25 p refs

(Contract N00014-75-C-0266)

(AD-A058526) Avail: NTIS HC A02/MF A01 CSCL 05/2

An integrated method for the long range planning of information services is presented. The problems associated with such planning are discussed along with requirements for such planning. The method consists of six stages beginning with understanding the current environment and ending with the evaluation criteria of projects. An intermediate level, strategic information services planning, is proposed to develop a project slate to be activated through an action plan. An approach to implementation is suggested. Two applications are discussed. Author (GRA)

N79-13919# Dayton Univ. Research Inst., Ohio.

CONSOLIDATION OF TECHNICAL INFORMATION ACTIVITIES SEVERAL AIR FORCE RESEARCH LABORATORIES INTO A SINGLE TECHNICAL INFORMATION CENTER Final Report, 1 Jul. 1975 - 30 Sep. 1977

Frederic L. Scheffler and Jacqueline F. March Wright-Patterson AFB, Ohio AFML Jun. 1978 86 p refs

(Contract F33615-75-C-5005)

(AD-A058628; UDRI-TR-78-14; AFML-TR-78-94) Avail: NTIS HC A05/MF A01 CSCL 05/2

In order to improve technical information services to four research and development laboratories -- Air Force Materials Lab (AFML), Air Force Avionics Lab (AFAL), Air Force Flight Dynamics Lab (AFFDL), and Air Force Aeropropulsion Lab (AFAPL) -- the information activities of each individual laboratory are being consolidated into a centralized facility. This consolidation is being accomplished under the auspices of the Air Force Wright Aeronautical Laboratory (AFWAL), a new organization which combines the planning and operations activities of the four laboratories. The AFWAL Technical Information Center (AFWAL-TIC) was chartered (1) to improve the flow of technical information; (2) to effect economies by large-scale operation and elimination of undesirable duplication; (3) to support the information needs of AFWAL scientists, engineers, and managers; (4) to provide efficient and economical library service; (5) to promote research of and reference to available scientific and technical information; and (6) to operate Information for Industry Offices. GRA

N79-13920# National Technical Information Service, Springfield, Va.

URBAN INFORMATION SYSTEMS. PART 1: GENERAL. VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - 1978

Mary E. Young Sep. 1978 174 p

(NTIS/PS-78/1027/8) Avail: NTIS HC $28.00/MF $28.00 CSCL 05B

Research is cited on urban management and municipal information systems. Part 1 includes reports not sponsored by USAC (Urban Information Systems Interagency Committee). The reports are intended for use by urban administrators and planners at all levels of management. GRA

N79-13921# National Technical Information Service, Springfield, Va.

URBAN INFORMATION SYSTEMS. PART 1: GENERAL. VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1977 - Sep. 1978

Mary E. Young Sep. 1978 121 p Supersedes NTIS/PS-77/0936; NTIS/PS-76/0720; NTIS/PS-75/623 (NTIS/PS-78/1028/8; NTIS/PS-77/0936; NTIS/PS-76/0720; NTIS/PS-75/623) Avail: NTIS HC $28.00/MF $28.00 CSCL 05B

Research is cited on urban management and municipal information systems. Part 1 includes reports not sponsored by USAC (Urban Information Systems Interagency Committee). The reports are intended for use by urban administrators and planners at all levels of management. GRA

N79-13922# National Technical Information Service, Springfield, Va.

URBAN INFORMATION SYSTEMS. PART 2: USAC REPORTS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1978

Mary E. Young Sep. 1978 367 p Supersedes NTIS/PS-77/0937; NTIS/PS-76/0721; NTIS/PS-75/624 (NTIS/PS-78/1029/4; NTIS/PS-77/0937) Avail: NTIS HC $28.00/MF $28.00 CSCL 05B

Research on urban management and municipal information systems is presented. Part 2 consists of reports sponsored by USAC (Urban Information Systems Interagency Committee), organized by participating cities. These reports are on systems designed as models for future planning and use by all municipalities. GRA

N79-13923# Precision Instrument Co., Santa Clara, Calif.

SLIDESTORE (TRADE NAME) LARGE CAPACITY INFORMATION STORAGE Final Report

Edward M. Kaczorowski, David F. Taylor, and Lawrence Y. L. Shen 1978 71 p refs (Grant APR-77-19528)
(PB-284479/3; NSF/RA-780067) Avail: NTIS HC A04/MF A01 CSCL 09B

Prospects are evaluated in areas key to the development of a large capacity optical storage system which records information by forming submicron holes in a thin metal film. A survey of commercially available microscope objectives found that 500 hole fields were an upper limit in performance and could be used with A-O deflected beams for Reading and Writing. A high performance objective lens was designed having a field of 2,000 submicron points. With such a lens, desired data rates could be achieved with mechanical scanners. The output characteristics of several laser diodes were examined. Tests using micro-cylindrical lens to confine the highly asymmetric beam revealed extreme sensitivity to lens positioning and modulation caused by feedback of reflected light into the lasing cavity. A Read/Write Subsystem was built to make quantitative measurements of media sensitivity and defect rate. A variety of metal films were tested as recording media. GRA

N79-13924# Minneapolis Medical Research Foundation, Inc., Minn.

MONITORING THE ACCESSIBILITY AND QUALITY OF ESRD SERVICES: USES OF DATA FROM THE NATIONAL MEDICAL INFORMATION SYSTEM Final Report, Aug. 1976 - Dec. 1977

John Hammond, Fred L. Shapiro, and Daniel B. McLaughlin Dec. 1977 195 p refs (Contract PHS-HSA-240-QA-18(7))
(PB-285133/5; HSA/OPEL-77/14) Avail: NTIS HC A09/MF A01 CSCL 05B

The use, at the local and regional level, of data contained in the End-Storage Renal Disease (ESRD) Medical Information System is described and illustrated. For both the accessibility issue and the quality issue, conceptual perspectives first were developed to identify discrete elements of each of these service dimensions. Then quantitative measures were examined using data generated by a prototype system. The report includes descriptions of the ESRD program and its medical information system, an overview of quality assurance and areawide planning, discussion of accessibility concepts and the rationale for an outcome base ESRD quality assurance program, as well as the display of patient service statistics. GRA

N79-13925# National Library of Medicine, Bethesda, Md.

PERMUTED MEDICAL SUBJECT HEADINGS, 1979

Oct. 1978 333 p refs Revised
(PB-286393/4; NLM-MED-78-05) Avail: NTIS HC E05/MF A01 CSCL 05B

Permuted Medical Subject Headings, 1979, is a computer-generated display of all terms, i.e., descriptors and cross references, in the alphabetic list of the National Library of Medicine's Medical Subject Headings (MeSH) for 1979, as well as all citation type, check tag, and geographic descriptors in the Annotated Alphabetic MeSH, 1979. The Permuted MeSH takes each significant word that appears in each MeSH term and then lists all the MeSH terms in which that word appears. The significant words are at the margin sorted character by character, with letters sorted alphabetically, numbers sorted in numerical sequence, and numbers following letters. Indented under each significant word are the terms containing that word sorted as in the alphabetic list of MeSH; cross references are listed with their referred-to descriptors. GRA

N79-13926# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

MANUAL OF DOCUMENT PRACTICES APPLICABLE TO DEFENCE-AEROSPACE SCIENTIFIC AND TECHNICAL INFORMATION, VOLUME 1

S. C. Schuler Aug. 1978 70 p refs
(AGARD-AG-235-Vol-1; ISBN-92-835-1291-X) Avail: NTIS HC A04/MF A01

The problems and techniques associated with processing unpublished technical reports and related materials in defense and aerospace information centers are addressed. Practical guidelines are given for procuring, accessioning, abstracting, and indexing documents other than books and journals. The values of manual and automated systems are assessed. For individual titles, see N79-13927 through N79-13929.

N79-13927*# NASA Scientific and Technical Information Facility, Baltimore/Washington International Airport, Md. 21240.

ACQUISITION AND SOURCES

Philip F. Eckert (Informatics Inform. Systems Co.) *In* AGARD Manual of Doc. Pract. Appl. to Defence-Aerospace Sci. and Tech. Inform., Vol. 1 Aug. 1978 p 1-22 refs (For primary document see N79-13926 04-82)
Avail: NTIS HC A04/MF A01 CSCL 05B

Suggestions and ideas for acquiring documents or their surrogates for a planned or fledgling information system are offered. The problems of selectivity of documents or their surrogates, both in superabundant quantities, and duplicate checking are highlighted. Acquisitioning flow, a semiautomated duplicate search technique, and alerting methods for prospective documentation are described. Appendices include two category systems, selected definitions and acronyms, and a selected address list for document procurement. Author

N79-13928# Defense Documentation Center, Alexandria, Va. Defense Logistics Agency.

DESCRIPTIVE CATALOGING

Barbara P. Gladd, Olga G. Luchaka, and James C. Wade *In* AGARD Manual of Doc. Pract. Appl. to Defence-Aerospace Sci. and Tech. Inform., Vol. 1 Aug. 1978 p 23-44 refs (For primary document see N79-13926 04-82)
Avail: NTIS HC A04/MF A01

The functions and purposes of descriptive cataloging as applied to processing technical report literature are defined and the comparative merits of manual vs. automated systems are discussed. Descriptive data elements required for processing technical reports are listed and guidelines are given for using these elements in a system presently automated or which may be automated in the future. A conversion table is included to indicate the relationship to data elements used in conventional cataloging. The consolidated experience of large documentation centers in the United States was used to develop the guidelines. A.R.H.

N79-13929# National Federation of Abstracting and Indexing Services, Philadelphia, Pa.
ABSTRACTING AND SUBJECT ANALYSIS
Toni Carbo Bearman *In* AGARD Manual of Doc. Pract. Appl. to Defence-Aerospace Sci. and Tech. Inform., Vol. 1 Aug. 1978 p 45-64 refs (For primary document see N79-13926 04-82)
Avail: NTIS HC A04/MF A01

A practical approach to abstracting and indexing in aerospace and defense documentation centers is presented for senior staff setting up a new system, as well as for junior staff interested in training assistance. Major subject areas covered include abstracting, subject and analysis, thesaurus development, and automation. Specific aspects such as definition and scope, types of indexes and abstracts, and relevant standards are discussed. Various techniques are summarized and references to authoritative texts are cited. A.R.H.

N79-13992# Joint Publications Research Service, Arlington, Va.
LATEST DEVELOPMENT IN AUTOMATIC DOCUMENT PROCESSING
Aleksey Pershin *In its* Trans. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 16-19 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 41, Oct. 1978 22 p (For primary document see N79-13989 04-99)
Copyright. Avail: NTIS HC A05/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N79-13930# Bureau of Mines, Washington, D. C.
ALUMINUM Mineral Commodity Profiles
John W. Stamper May 1978 36 p refs
(PB-285413/1; BM-MCP-14) Avail: NTIS HC A03/MF A01 CSCL 05C

The world aluminum industry is reviewed in terms of ownership and geographic distribution. Bauxite resources, mining, and production processes through the primary metal stage and secondary recovery are briefly described. The economic and environmental factors associated with aluminum production are discussed. The report gives an overview of the uses of aluminum metal in transportation, construction, food and beverage packaging, electrical equipment, machinery, consumer products, and uses of bauxite and alumina in refractories, abrasives and chemicals, and forecasts the use of aluminum to the year 2000. GRA

N79-13931# Bureau of Mines, Washington, D. C.
IRON AND STEEL Mineral Commodity Profiles
Donald H. Desy Jul. 1978 36 p refs
(PB-285195/4; BM-MCP-15) Avail: NTIS HC A03/MF A01 CSCL 05C

A general overview of the world iron and steel industry is presented. Beginning with a brief history, the report discusses the size, organization and structure of the industry, and the technology, definitions, specifications and uses of iron and steel. The supply-demand relationships for the United States and the rest of the world and the distribution of iron and steel demand in the United States by end use is discussed. Economic factors such as capital costs, prices, employment and productivity, taxes, and tariffs are included. A discussion of environmental, pollution control and occupational factors is included. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N79-13932# Committee on Commerce, Science, and Transportation (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ACT OF 1958, AS AMENDED, AND RELATED LEGISLATION
Washington GPO 1978 190 p Rept. for Comm. on Commerce, Sci., and Transportation, 95th Congr., 2d Sess., Dec. 1978
(GPO-34-175) Avail: Comm. on Commerce, Sci., and Transportation

A compilation of the texts of the public laws that relate to aeronautical and space research and development activities is presented. Emphasis is placed on how these activities relate to the functions and responsibilities of the National Aeronautics and Space Administration. J.M.S.

N79-13933# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1980. PROGRAM REVIEW. VOLUME 1, PART 1
Washington GPO 1978 529 p refs Hearings before the Subcomm. on Space Sci. and Applications of the Comm. on Sci. and Technol., 95th Congr., 2d Sess., No. 100, 25-27 Sep. 1978
(GPO-35-914) Avail: Subcomm. on Space Sci. and Applications

Current problems of cost, performance, or schedule which affect the NASA budget and program performance are considered with emphasis on the space transportation system and the space tracking and data systems. J.M.S.

N79-13934# Department of Energy, Washington, D. C. Office of Regulations and Emergency Planning.
PROPOSED STANDBY GASOLINE RATIONING PLAN. ECONOMIC AND REGULATORY ANALYSIS DRAFT
Jun. 1978 293 p
(DOE/ERA-0009) Avail: NTIS HC A13/MF A01

The potential economic impacts of the gasoline rationing contingency plan on the total national economy were evaluated using three separate projections: (1) the normal U.S. economy for a future period-the last quarter of 1980 through the third quarter of 1981; (2) the impacts which a petroleum supply interruption would have on the U.S. economy during this future period, assuming that DOE's standby allocation and price control regulations were implemented for crude oil and products; and (3) the incremental impacts of the gasoline rationing program on this already-perturbed future U.S. economy. DOE

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N79-13935 Washington Univ., Seattle.
A METHODOLOGY FOR EVALUATING THE POTENTIAL MATERIALS AND ENERGY RECOVERY FROM MUNICIPAL SOLID WASTE Ph.D. Thesis
Charles Edward Findley 1978 222 p
Avail: Univ. Microfilms Order No. 7824451

The methodology considers the uncertainty associated with switching to resource recovery from the perspective of the local decision maker. The approach makes maximum use of both objective and subjective information. The methodology provides a mechanism for the decision maker to combine his own opinion with those of his experts. It also includes provisions for the decision maker to assess and weigh his degree of confidence in his own opinion relative to his confidence in his experts. Application of this approach results in estimates of operating deficits which will occur with successful, unsuccessful and expected outcomes. Dissert. Abstr.

N79-13936*# Boeing Services International, Inc., Kennedy Space Center, Fla.
TRADE STUDY: LIQUID HYDROGEN TRANSPORTATION - KENNEDY SPACE CENTER

Donald J. Gray Sep. 1978 234 p
(Contract NAS10-9200)
(NASA-CR-157969; KSC-GP-28-01) Avail: NTIS
HC A11/MF A01 CSCL 13F

Cryogenic transportation methods for providing liquid hydrogen requirements are examined in support of shuttle transportation system launch operations at Kennedy Space Center, Florida, during the time frames 1982-1991 in terms of cost and operational effectiveness. Transportation methods considered included sixteen different options employing mobile semi-trailer tankers, railcars, barges and combinations of each method. The study concludes that the most effective method of delivering liquid hydrogen from the vendor production facility in New Orleans to Kennedy Space Center includes maximum utilization of existing mobile tankers and railcars supplemented by maximum capacity mobile tankers procured incrementally in accordance with shuttle launch rates actually achieved. G.G.

N79-13937*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
UTILIZATION OF WASTE HEAT IN TRUCKS FOR INCREASED FUEL ECONOMY Final Report
C. J. Leising, G. P. Purohit, S. P. DeGrey, and J. G. Finegold Jun. 1978 37 p refs
(Contract EX-76-A-31-1011)
(NASA-TM-79966; HCP/M1011-02) Avail: NTIS
HC A03/MF A01 CSCL 13F

The waste heat utilization concepts include preheating, regeneration, turbocharging, turbocompounding, and Rankine engine compounding. Predictions are based on fuel-air cycle analyses, computer simulation, and engine test data. All options are evaluated in terms of maximum theoretical improvements, but the Diesel and adiabatic Diesel are also compared on the basis of maximum expected improvement and expected improvement over a driving cycle. The study indicates that Diesels should be turbocharged and aftercooled to the maximum possible level. The results reveal that Diesel driving cycle performance can be increased by 20% through increased turbocharging, turbocompounding, and Rankine engine compounding. The Rankine engine compounding provides about three times as much improvement as turbocompounding but also costs about three times as much. Performance for either can be approximately doubled if applied to an adiabatic Diesel. DOE

N79-13938# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
IMPROVED PASSENGER CAR BRAKING PERFORMANCE Final Summary Report, Jun. 1976 - Feb. 1978
R. D. Ervin, J. D. Campbell, M. Sayers, and H. Bunch Mar. 1978 30 p ref
(Contract DOT-HS-6-01368)
(PB-284243/3; UM-HSRI-78-12-1) Avail: NTIS
HC A03/MF A01 CSCL 13F

Test conditions were studied as candidates for extending the scope of the stopping distance requirements of FMVSS 105-75, Hydraulic Brake Systems. Conditions of interest included low and split friction surfaces as well as straight-line braking and braking-in-a-turn maneuvers. Two large test programs were conducted and various analytical efforts were applied to the examination of the candidate test conditions and methods. Throughout all of the study activities, only stopping distance performance was taken as the measure for evaluating the utility of the candidate conditions and methods. It was concluded that only the low friction, straight-line braking condition constitutes a viable extension of the stopping requirements of 105-75. GRA

N79-13939# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
IMPROVED PASSENGER CAR BRAKING PERFORMANCE: APPENDICES Final Report, Jun. 1976 - Feb. 1978
R. D. Ervin, J. D. Campbell, M. Sayers, and H. Bunch Mar. 1978 199 p
(Contract DOT-HS-6-01368)
(PB-284396/9; UM-HSRI-78-12-3) Avail: NTIS
HC A09/MF A01 CSCL 13F

Test conditions were studied and the results include: data from twelve-car survey test program vehicle descriptions and data summaries; calculated results of a quasi-static analysis; data from in-depth test program on five cars; simulation results using dynamic braking models; a look at the accuracy of simplified methods for computing reference vehicle ideal stopping distance for the braking efficiency test technique; antilock braking model; and test sequence and procedure. GRA

N79-13940# Battelle Columbus Labs., Ohio.
TECHNOLOGY TRANSFER AS A MOTIVATION FOR UNITED STATES DIRECT INVESTMENT BY EUROPEAN FIRMS
W. Halder Fisher 31 Dec. 1977 15 p refs 2 Vol.
(Grant NSF PRA-75-09593)
(PB-284792/9; NSF/PRA-7509593/1/8) Avail: NTIS
HC A02/MF A01 CSCL 05C

The much longer report, issued under the same title, submitted to the United States National Science Foundation is summarized. The work reported in these two documents was carried out during a period of almost three years beginning early in 1975. The investigated problem relates to: (1) the motivation for direct European investments in the United States; and (2) the role of such investments as vehicles for technology transfer between the United States and Europe. GRA

N79-13941# Battelle Columbus Labs., Ohio.
TECHNOLOGY TRANSFER AS A MOTIVATION FOR UNITED STATES DIRECT INVESTMENT BY EUROPEAN FIRMS Final Report
W. Halder Fisher 31 Dec. 1977 136 p refs 2 Vol.
(Grant NSF PRA-75-09593)
(PB-284793/7; NSF/PRA-7509593/2/8) Avail: NTIS
HC A07/MF A01 CSCL 05C

A methodology is developed to: (1) assess technology transfer into and/or out of the U.S. involving a U.S. subsidiary of a foreign enterprise; and (2) evaluate the significance of technology transfer as an explanation for growing direct investment of foreign corporations in the U.S. It examines seven retrospective case studies of selected investments by foreign enterprises to provide an indication of transfer of manufacturing technology. These studies examine in- and out-flow of know-how in terms of patent acquisitions; capital, procedural, and output changes; personnel transfers and exchange. GRA

N79-13942# Urban Inst., Washington, D.C.
THE APPLICATION OF TECHNOLOGICAL DEVELOPMENTS TO PHYSICALLY DISABLED PEOPLE Final Report
Joseph LaRocca and Jerry S. Turem May 1978 127 p
(Grant NSF PRA-76-82314)
(PB-284795/2; UI-1232-1; NSF/PRA-762314/1/8) Avail: NTIS HC A07/MF A01 CSCL 05K

The effect of technological developments of disabled people was analyzed with emphasis on general developments intended to benefit the population at large and specific developments directed to the needs of the handicapped in particular. The impact of change on employment, transportation, communication, housing, and self-care for specific groups within the handicapped population is discussed. GRA

N79-13943# Research Group International, Charlottesville, Va.
DEVELOPMENT PLANS AND TECHNOLOGY TRANSFER Final Report
William F. Beazer Jan. 1978 110 p
(PB-284958/6; NSF/PRA-77-SP-0857/1/8) Avail: NTIS
HC A06/MF A01 CSCL 05C

Past economic development plans of a sample of five countries were examined to determine goals and targets set out in these plans. The extent to which these targets were achieved are analyzed using past economic and social data. Present development plans are reviewed to determine which specific objectives each nation hopes to accomplish, including industries each nation hopes to establish and/or expand within each sector (agriculture, manufacturing, mining, services). A framework for the assessment of technology needs and imports for developing countries is provided. GRA

N79-13944# Office of Technology Assessment, Washington, D. C.
REPORT TO THE CONGRESS FOR 1977 Annual Report
31 Dec. 1977 99 p
(PB-284942/0; OTA-A-68) Avail: NTIS HC A05/MF A01

CSCL 05A

The activities of the Office of Technology Assessment (OTA) for the calendar year 1977 are summarized. OTA organization and operations, technology assessment methods and approaches are discussed. A list of published reports and a list of members of the advisory boards and panels which assist OTA in its work are included. GRA

N79-13945# National Science Foundation, Washington, D. C. Applied Science and Research Applications.

PROJECT SUMMARIES, FISCAL YEARS 1967-1978, INCLUDING THE TRANSITION

Nov. 1977 316 p

(PB-284853/9; NSF/RA-770519) Avail: NTIS HC A14/MF A01 CSCL 05A

The National Science Foundation's Office of Intergovernmental Programs has since 1967 supported projects that facilitate the integration of research and technology as essential resources into the policy and program planning and execution activities of state and local governments. In 1975 the National Science Foundation announced the creation of the Division of Intergovernmental Science and Public Technology. The Division includes the Intergovernmental Programs, thus reflecting the consolidation of the Intergovernmental Science Programs initiated in FY 1967, and the experimental Research and Development Incentives Program (Public Sector) initiated in FY 1973. Awards made fall into the following areas: Local Government, State Government (Executive), State Government (Legislative), and Science and Technology Resources. The latter includes projects in Federal laboratories, public sector projects in colleges and universities, and projects to test private sector methods in the public sector. The document lists the above projects chronologically within each fiscal year. There is an index by State. GRA

N79-13946# Stanford Univ., Calif. Dept. of Civil Engineering.

WATER FACTORY 21: RECLAIMED WATER, VOLATILE ORGANICS, VIRUS, AND TREATMENT PERFORMANCE Pre-final Report, Jan. 1976 - Jun. 1977

Perry L. McCarty, Martin Reinhard, Carla Dolce, Huong Nguyen, and David G. Argo Jun. 1978 100 p refs

(Grant EPA-S-803873)

(PB-285053/5; EPA-600/2-78-076) Avail: NTIS HC A05/MF A01 CSCL 13B

The performance of Water Factory 21, a 0.66 cu m/s advanced wastewater treatment plant designed to reclaim secondary effluent from a municipal wastewater treatment plant so that it can be used for injection and recharge of a groundwater system is described. Included in this evaluation of the first one and one-half years of performance are summary data for general inorganics, heavy metals, virus, and a broad range of organic materials. Processes included in the plant are lime treatment, ammonia stripping, breakpoint chlorination, filtration, activated-carbon adsorption, reverse osmosis, and final chlorination. The performance of individual processes as well as overall efficiency was evaluated. GRA

N79-13947# Culp/Wesner/Culp, El Dorado Hills, Calif.

BENEFICIAL DISPOSAL OF WATER PURIFICATION PLANT SLUDGES IN WASTEWATER TREATMENT Final Report, Aug. 1974 - Apr. 1977

John O. Nelson, Charles A. Joseph, and Russell L. Culp May 1978 33 p Prepared in cooperation with North Marin County Water District, Novato, Calif.

(Grant EPA-S-803336)

(PB-285230/9; EPA-600/2-78-089) Avail: NTIS HC A03/MF A01 CSCL 13B

The advantages and disadvantages of the disposal of waste alum sludge from a water treatment plant to a municipal waste water treatment plant over a three year period are examined. No adverse effects on the sewage treatment process were revealed; however, solids loading to the digester was increased. Biochemical and chemical oxygen demand removals were not affected. Phosphorus removal and the settling characteristics of sludge in secondary clarification were improved. GRA

N79-13948# O'Brien and Gere Engineers, Inc., Syracuse, N. Y.

HIGH RATE NUTRIENT REMOVAL FOR COMBINED SEWER OVERFLOWS. BENCH SCALE AND DEMONSTRATION SCALE STUDIES Final Report

C. B. Murphy, Jr., Orest Hrycyk, and William T. Gleason Jun. 1978 75 p refs Sponsored in part by Onondaga County Dept. of Public Works, Syracuse, N. Y.

(Grant EPA-S-802400)

(PB-285473/5; EPA-600/2-78-056) Avail: NTIS HC A04/MF A01 CSCL 13B

A high rate physical/chemical treatment system has been evaluated for the removal of suspended solids and the macronutrients, phosphorus and nitrogen, from combined sewer overflow. The system utilized a single unit process concept consisting of in-line chemical addition, coagulation, flocculation, high rate filtration and ion exchange. The results demonstrate that the simultaneous removal of suspended solids, phosphorus, and ammonia-nitrogen from a combined sewer overflow is feasible using the high rate unit process concept. Suspended solids removal ranged from 90-100% with alum and polymer dosages of 220 mg/l and 1 mg/l, respectively. GRA

N79-13949# Michigan Univ., Ann Arbor. Dept. of Civil Engineering.

NITRIFICATION OF SECONDARY MUNICIPAL WASTE EFFLUENTS BY ROTATING BIO-DISCS Final Report, Jan. 1975 - Oct. 1977

Jack A. Borchardt, Shin Jon Kang, and Tai Hak Chung Jun. 1978 153 p refs

(Grant EPA-R-803407)

(PB-285240/8; EPA-600/2-78-061) Avail: NTIS HC A08/MF A01 CSCL 13B

The effectiveness of nitrifying secondary effluent with rotating biological surfaces (RBS) was evaluated in municipal effluents from a high rate trickling filter and from a two-stage, flow through lagoon. A RBS pilot plant was installed at each of the treatment plant to provide a continuous flow of secondary treated effluent. The RBS pilot plant at the high rate trickling filter plant provided satisfactory results which showed the effect on effluent ammonia-nitrogen reductions by operational changes at the RBS pilot plant. The RBS pilot plant at the lagoon system encountered operating difficulties which resulted in an early cancellation for this phase of the project. GRA

N79-13950# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.

MICROWAVE PLASMA DETOXIFICATION PROCESS FOR HAZARDOUS WASTES. PHASE 2: SYSTEMS APPLICATION EVALUATION Final Report, 2 Feb. - Jul. 1977

L. J. Bailin Jun. 1978 33 p refs

(Contract EPA-68-03-2190)

(PB-284652/5; EPA-600/2-78-080) Avail: NTIS HC A03/MF A01 CSCL 13B

Materials in search of a disposal method, such as the microwave plasma detoxification process (MWP), were surveyed. Included are the following exceedingly dangerous compounds and mixtures: Cancer-causing nitrosamines, vinyl and vinylidene chlorides, dioxin-containing organohalogens, and aromatic amine compounds; organometallic compounds and heavy metal complexes derived from industrial processes and pesticides; and nerve-poisons from military sources, which include organophosphorus chemicals stock-piled above ground, and from pesticide wastes which are only slightly less hazardous. GRA

N79-13951# Illinois Univ. at Chicago Circle, Chicago.

A MODAL SPLIT MODEL FOR HIGH DENSITY URBAN CORRIDORS Final Report, Jun. 1976 - Jun. 1977

Sim Soot, Ashish Sen, and Efi Pagitsas Mar. 1978 146 p refs Sponsored by Urban Mass Transportation Administration, Wash. D.C.

(PB-284745/7; UMTA-IL-11-0008-78-2) Avail: NTIS HC A07/MF A01 CSCL 13B

Modal split models specifically for high density urban corridors was produced. In a two stage process splits were established between the automobile and public transportation, and then bus and rapid transit. The aggregate, trip interchange models were calibrated using weighted least squares, with modal disutility functions, service characteristics, and trip end densities as independent variables. The background for the modeling procedure was established by producing a multitude of computer generated maps displaying the modal split patterns and by graphing the

socioeconomic correlates of model split in the Chicago area.
GRA

N79-13952# FMC Corp., Itasca, Ill. Environmental Equipment Div.
STUDY OF ACTIVATED SLUDGE SEPARATION BY DYNAMIC STRAINING Final Report, May - Dec. 1974
James Dumanowski and Arvid Strom Jun. 1978 64 p refs
(Contract EPA-68-03-0427)
(PB-284903/2; EPA-600/2-78-070) Avail: NTIS HC A04/MF A01 CSCL 13B

Pilot plant studies were conducted on domestic wastewater to determine the feasibility of replacing or augmenting conventional activated sludge gravitational clarifiers by dynamic straining. Strainer effluent averaged 35 mg/l suspended solids with mixed liquor suspended solids (MLSS) of 6800 mg/l. The upflow and downflow sand filters, operating on strainer effluent, produced effluents of 8 and 3 mg/l suspended solids, respectively. Phase 2 which called for high flows and high biochemical oxygen demand loadings, was plagued with an intense growth of filamentous microorganisms, foaming, and development of a 'syrupy' mixed liquor. Proper strainer throughputs could not be maintained. Flow rates were not reproducible and did not correlate with prior work. GRA

N79-13953# University of Southern Calif., Los Angeles.
A CASE STUDY OF HAZARDOUS WASTES IN CLASS 1 LANDFILLS
Bert Eichenberger, J. R. Edwards, K. Y. Chen, and Robert D. Stephens (Calif. State Dept. of Health, Berkeley) Jun. 1978 114 p refs
(Grant EPA-R-803813)
(PB-284937/0; EPA-600/2-78-064) Avail: NTIS HC A06/MF A01 CSCL 13B

The average concentration, estimated daily deposition, and partitioning of 17 metal species in hazardous wastes discharged to five Class 1 landfill sites in the greater Los Angeles area are considered. These sites receive a combined estimated daily volume of 2.3 x 10 to the 6th l/day of hazardous wastes. A total of 320 samples were collected and consolidated into 99 samples representative of 17 industry types. The data were summarized for six general industry groups: petroleum, chemical, metal, foods, industrial cleaning, and miscellaneous/unknown.
GRA

N79-13954# Culp/Wesner/Culp Clean Water Consultants, Eldorado Hills, Calif.
A STUDY OF FORCED AERATION COMPOSTING OF WASTEWATER SLUDGE Final Report
William R. Ettlich and Anne E. Lewis Jun. 1978 66 p
(Contract EPA-68-03-2186)
(PB-285232/5; EPA-600/2-78-057) Avail: NTIS HC A04/MF A01 CSCL 13B

An independent assessment of the forced aeration wastewater sludge composting method as practiced at Beltsville, Maryland and Bangor, Maine is presented. A number of visits were made to both sites to observe operations under all weather conditions and to gather data. Results indicate that forced aeration sludge composting can be carried out in a satisfactory manner under nearly all weather conditions including severe New England winters. A number of problems and potential problems are identified along with possible solutions. Costs are very dependent on the size of the operation and the methods used. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N79-13955 California Inst. of Tech., Pasadena.
FINE-SCALE STRUCTURE OF THE NEUTRAL HYDROGEN ABSORPTION IN NGC1275 Ph.D. Thesis
Jonathan Daniel Romney 1979 101 p
Avail: Univ. Microfilms Order No. 7824376

The high-velocity 21 cm absorption feature in NGC1275 (=3C84) was mapped at an angular resolution of a few milliarcseconds. The method of analysis makes use of both the absolute amplitude of the visibility function in the continuum, and the relative amplitude and phase between the line and continuum. Fine-scale structure in the continuum is determined from the observations, and the 21 cm structure of 3C84 on angular scales covering almost six orders of magnitude is reviewed. Two basic hypotheses which was advanced to elucidate the 21 cm absorption and other high-velocity features in NGC1275 are discussed. The results of the present investigation strongly support the interpretation that all the high-velocity features arise in a superposed galaxy in the Perseus Cluster. The alternative model, in which the high-velocity gas is ejected from the active nucleus, is inconsistent with the structure observed in the H1 absorption. Dissert. Abstr.

N79-13956 Washington Univ., Seattle.
HII REGIONS AS EXTRAGALACTIC DISTANCE INDICATORS Ph.D. Thesis
Robert Charles Kennicutt, Jr. 1978 227 p
Avail: Univ. Microfilms Order No. 7824471

The use of giant H2 region diameters to measure distances to late-type spiral galaxies were critically examined. Sensitometrically calibrated H alpha image tube plates and photoelectric H alpha fluxes were obtained for the largest H2 regions in 40 of the galaxies. These data were used to produce isophotal maps for each nebula of interest, so that their structure could be studied directly, and the published diameters could be tested. Many of the nebulae studied, especially those located in luminous spiral galaxies, were found to possess rather illdefined outer envelopes of emission, caused either by their intrinsic physical structure or by confusion with neighboring nebulosities and background disk emission. Dissert. Abstr.

N79-13957 State Univ. of New York at Stony Brook.
NEUTRON STARS: MODELS AND COOLING Ph.D. Thesis
Oren Vinson Maxwell, Jr. 1978 321 p
Avail: Univ. Microfilms Order No. 7823141

Following a brief review of several aspects of neutron star physics, two subjects are treated in detail. The first concerns the structure of neutron stars. This is governed by a set of general relativistic, zero temperature structure equations, for which derivations for both nonrotating and slowly rotating objects are presented. Various treatments of hyperonic matter are reviewed briefly. The second problem concerns the cooling of neutron stars. This depends upon conditions in the interior, particularly upon the possible existence of nucleon superfluidity there.
Dissert. Abstr.

N79-13958*# Planetary Science Inst., Tucson, Ariz.
PLANETARY ASTRONOMY PROGRAM Final Report, 26 Oct. 1977 - 25 Oct. 1978
Clark R. Chapman and William K. Hartmann Oct. 1978 146 p refs
(Contract NASw-3134; Grant NGR-03-003-001)
(NASA-CR-157630) Avail: NTIS HC A07/MF A01 CSCL 03A

Observations and analyses of asteroids, Trojans and cometary nuclei are presented. Spectrophotometry was used to observe the cometary nuclei. The spectra are plotted as a function of semimajor axis and eccentricity. Trojans and other asteroids at great solar distances show a variety of spectra, many of them quite red despite the low measured albedoes for many of these asteroids. The asteroid spectra are grouped according to diameter and taxonomic class. S.B.S.

N79-13959*# Hale Observatories, Pasadena, Calif.
THE EIGHT MICRON BAND OF SILICON MONOXIDE IN THE EXPANDING CLOUD AROUND VY CANIS MAJORIS
T. R. Geballe, J. H. Lacy, and S. C. Beck [1978] 21 p refs
Prepared in cooperation with Calif. Univ. at Berkeley
(Grants NGL-05-003-272; NSF AST-77-12256)
(NASA-CR-157836) Avail: NTIS HC A02/MF A01 CSCL 03A

Observations of vibration-rotation transitions of silicon monoxide in VY CMa show that the lines originate in accelerating, expanding, and cool (600 K) layers of a circumstellar cloud at a distance of roughly 0.15 minutes from the central star. The central stellar velocity, as estimated from observed SiO P Cygni line profiles, is somewhat redshifted from the midpoint of the maser emission features. Most of the silicon is proabably in the form of dust grains. The isotopic ratios of silicon are nearly terrestrial. Author

N79-13960*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
OBSERVATION OF THE 63 MICRON (01) EMISSION LINE IN THE ORION AND OMEGA NEBULAE
Gary Melnick, George E. Gull, and Martin Harwit Jul. 1978 25 p refs
(Grant NGR-33-010-146)
(NASA-CR-157991; CRSR-696) Avail: NTIS HC A02/MF A01 CSCL 03A

The 63 micron fine structure transition P4 : 3PI yields 3P2 for neutral atomic oxygen was obtained during a series of flights at an altitude of approximately 13.7 km. In the Orion Nebula (M42), the observed line strength was 8 x 10 to the minus 15 power watt cm/2 which is estimated to be approximately 0.3 o/o of the energy radiated at all wavelengths. For the Omega Nebulae (M17), the line strength was 2.4 x 10 to the minus 15 power watt cm/2, and the fraction of the total radiated power was slightly higher. These figures refer to a 4' x 6' field of view centered on the peak for infrared emission from each source. The uncertainty in the line strength is approximately 50% and is caused by variable water vapor absorption along the flight path of the airplane. The line position estimate is 63.2 micron (+0.1, -0.2) micron. The prime uncertainty is due to the uncertain position of the (O I) emitting regions in the field of view. G.G.

N79-13961*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
THE 51.8 MICRON (O 3) LINE EMISSION OBSERVED IN FOUR GALACTIC H 2 REGIONS
Gary Melnick, George E. Gull, and Martin Harwit Aug. 1978 21 p refs
(Grant NGR-33-10-146)
(NASA-CR-157992; CRSR-699) Avail: NTIS HC A02/MF A01 CSCL 03A

The (O III) 51.8 microns line from four H II regions, M42, M17, W51 and NGC 6375A was detected. Respective line strengths are 7 x 10 to the minus 15 power, 1.0 x 10 to the minus 14 power, 2.1 x 10 to the minus 15 power and 2.6 x 10 to the minus 15 power watt cm/2. Observations are consistent with previously reported line position and place the line at 51.80 + or 0.05 micron. When combined with the 88.35 microns (O III) reported earlier, clumping seems to be an important factor in NGC 6375A and M42 and to a lesser extent in W51 and M17. The combined data also suggest an (O III) abundance of approximately 3 x 0.0001 sub n e' a factor of 2 greater than previously assumed. G.G.

N79-13964# Joint Publications Research Service, Arlington, Va.
COSMONAUT GUBAREV DISCUSSES ORBITAL TELESCOPES
A. Gubarev *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 50-60 Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 8, 1978 p 34-35 and no. 9, 1978 p 30-31 (For primary document see N79-13989 04-99)
Copyright. Avail: NTIS HC A05/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N79-13962 California Inst. of Tech., Pasadena.
SUPERMASSIVE BLACK HOLES IN GALACTIC NUCLEI Ph.D. Thesis
Peter John Young 1979 63 p
Avail: Univ. Microfilms Order No. 7824377

The theoretical distribution of a stellar population around a massive black hole in a galactic nucleus is studied. The luminous energy output such a black hole could achieve by wrecking carnage among the stars in that nucleus is calculated. A photometric study of the radio galaxy M87 is presented. A dynamic study of the same galaxy M87 via spectroscopic measurements of the velocity dispersion as a function of radius is also presented. The dynamics of the E5 galaxy NGC 4473 is studied and found to exhibit scant rotation. Dissert. Abstr.

N79-13963 Stanford Univ., Calif.
GRAVITATIONAL RADIATION FROM: 1. TWO-BODY SYSTEMS; 2. SLOWLY-ROTATING SUPERNOVAE Ph.D. Thesis
Michael Stanley Turner 1978 206 p
Avail: Univ. Microfilms Order No. 7822587

A post-Newtonian expansion method is used to calculate the radiation potential; all other quantities of interest are derived from it. The post-Newtonian expansion method is a weak field, slow-motion expansion; at Newtonian (lowest) order it is the usual quadrupole formalism. The radiation potential for an unbound system of two point masses is calculated at Newtonian order. From this, waveforms, luminosity distribution, energy spectra, and total energy are computed. In the limit of large orbital eccentricity (gravitational bremsstrahlung process) post-Newtonian corrections through post-1 order are calculated. A linear perturbation formalism is developed to calculate the tidally-induced contributions to the radiation potential at Newtonian order. A technique is developed to add slow rotation to exact spherical supernovae models. Perturbation equations are derived at first and second order in the rotational velocity. Dissert. Abstr.

N79-13964 Arizona Univ., Tucson.
EMPIRICAL GRAVITIES AND TEMPERATURES FOR DA WHITE DWARFS Ph.D. Thesis
Santiago Tapia Perez 1978 150 p
Avail: Univ. Microfilms Order No. 7823776

A sample of 46 DA white dwarfs was observed with a four band photometric system designed to prove the determination of surface gravities and effective temperatures of this class of stars. The spectral sensitivity of the photometric bands was derived by independent measurements of the transmission optics and filters, and the relative response of the detector. The spectral sensitivity of each band was convolved with the energy distribution of DA white dwarfs model atmospheres to compute synthetic color indices. The synthetic and observed colors were matched on the plane defined by two reddening-free indices in order to derive gravities and temperatures. Dissert. Abstr.

N79-13965 California Inst. of Tech., Pasadena.
NEUTRINO PRODUCTION AND TRANSPORT DURING GRAVITATIONAL COLLAPSE Ph.D. Thesis
John Richard Bond 1979 333 p
Avail: Univ. Microfilms Order No. 7824371

The P-N method is developed to describe the transport of neutrinos in collapsing stellar cores, and the multigroup flux limited diffusion and equilibrium diffusion approximations are obtained from it. An effective Lagrangian for weak neutral and charged current neutrino interactions which is applicable to low energy neutrino processes was derived. The neutrino source functions which enter into the P-N equations were given a many body theory formulation in terms of weak current-current correlation functions. The scattering reactions (both for non-degenerate and degenerate nucleons), and the production and absorption reactions were developed. These equations are then applied to the various phases of neutrino flow during iron core collapse: the transparent stage to the onset of trapping; the approach to electron neutrinos

to beta-equilibrium; the evolution of the muon neutrino and antineutrino distribution functions towards the Fermi-Dirac form; the conditions for radiative energy loss; and comparison of the P-1 and flux limited diffusion methods of spatial transport in a static pre-bounce core. Dissert. Abstr.

N79-13966 Princeton Univ., N. J.
A NEW SCALING LAW FOR GALAXY CLUSTERING Ph.D. Thesis
Suketu Prafulchandra Bhavsar 1978 114 p
Avail: Univ. Microfilms Order No. 7823505

Group catalogs of galaxies were generated for the Zwicky, mg less than or equal to 15.0, 14.0, 13.0 and 12.0 samples. The catalogs were generated for a wide range of surface density enhancements Beta, ranging from Beta approximately 1.5 to Beta approximately 10,000. It was found that for these samples f sub g varies as Beta to the minus alpha power where alpha is constant and f sub g is the fraction of galaxies in groups. This new result is another way in which galaxy cluster shows no intrinsic scales. N-body simulations were analyzed with respect to their initial conditions using the scaling parameter f sub g. Point mass models give a power law for f sub g (Beta). For models with large initial random motions f sub g decreases too fast with Beta. It is inferred from this that point mass galaxies are preferred to finite sized ones, and that small initial velocities are preferred to large random velocities. Dissert. Abstr.

N79-13967*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.
THOLINS: ORGANIC CHEMISTRY OF INTERSTELLAR GRAINS AND GAS
Carl Sagan and B. N. Khare Sep. 1978 27 p refs
(Grant NGR-33-010-101)
(NASA-CR-157990; CRSR-700) Avail: NTIS HC A03/MF A01 CSCL 03B

A complex organic solid produced from cosmically abundant molecules explains many properties of the interstellar grains and gas. The product, a brown, sometimes sticky residue that is resistant to conventional analytic chemistry, has been named tholins and is discussed as a major consituent of the interstellar medium. Sequential and nonsequential pyrolysis followed by gas chromatography/mass spectroscopy were used to determine something of the composition of this material. The production and properties of tholins produced by spark discharges and by ultraviolet light are examined. A.R.H.

N79-13968*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TOPICS IN ASTROPHYSICAL X-RAY AND GAMMA RAY SPECTROSCOPY Ph.D. Thesis - Maryland Univ.
Roger W. Bussard Nov. 1978 131 p refs
(Grant NGR-21-002-316)
(NASA-TM-79690) Avail: NTIS HC A07/MF A01 CSCL 03B

A number of topics relating to astrophysical observations that have already been made or are currently planned of spectral features, mostly emission lines, in the X-ray and gamma ray region of the electromagnetic spectrum are investigated. These topics include: the production of characteristic X-ray and gamma ray lines by nonthermal ions, spectral features induced by processes occurring in strong magnetic fields, and the positron annihilation line at 0.5 MeV. The rate of X-ray production at 6.8 keV by the 2p to 1s transition in fast hydrogen- and helium-like iron ions, following both electron capture to excited levels and collisional excitation is calculated. The cross section for electron-ion Coulomb collisions in strong fields is also calculated. G.Y.

N79-13969*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTENSE MAGNETIC FIELDS AT 1 AU: SOLAR CYCLE 20
L. F. Burlaga and J. H. King Nov. 1978 33 p refs Submitted for publication
(NASA-TM-79674) Avail: NTIS HC A03/MF A01 CSCL 03B

Of the intense magnetic fields (greater than 13 gamma) observed at 1 AU during solar cycle 20 (1973-1975), 92% were associated with shocks, stream interfaces, or cold magnetic enhancements (CMEs). Most (52%) of the magnetic field intensity enhancements occurred at stream interfaces; 27% occurred behind shocks without interfaces; and 11% occurred in CMEs. The most intense fields (25 gamma to 37 gamma) followed shocks. Magnetic field intensities at interfaces did not exceed 25 gamma, suggesting a mechanism such as a magnetoacoustic wave limits the intensity ahead of streams. Intense magnetic fields persist longest behind shocks. Author

N79-13970# Texas Univ., Austin. Center for Particle Theory.
ASTROPHYSICAL BOUNDS ON THE MASSES OF AXIONS AND HIGGS PARTICLES
D. A. Dicus, E. W. Kolb, V. L. Teplitz (Virginia Polytech. Inst. and State Univ.), and R. V. Wagoner (Stanford Univ., Calif.) Apr. 1978 25 p refs
(Contract EY-76-S-05-3992; Grant NSF PHY-76-21454)
(ORO-3992-337) Avail: NTIS HC A02/MF A01

Lower bounds on the mass of a light scalar (Higgs) or pseudoscalar (axion) are found in three ways: (1) by requiring that their effect on primordial nucleosynthesis not yield a deuterium abundance outside present experimental limits; (2) by requiring that the photons from their decay thermalize and not distort the microwave background; (3) by requiring that their emission from helium burning stars (red giants) not disrupt stellar evolution. The best bound is from (3); it requires the axion or Higgs mass to be greater than 0.2 MeV. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N79-13971 Minnesota Univ., Minneapolis.
THE NATURE OF THE EXOTIC COMPONENT IN LUNAR SOILS AND ITS IMPLICATIONS FOR LUNAR DIFFERENTIATION HISTORY Ph.D. Thesis
Norman Marcel Evensen 1978 236 p
Avail: Univ. Microfilms Order No. 7823904

Because previous early analyses of the lunar regolith implied the presence of a component with a high abundances of incompatible trace elements such as K, Rb, Ba, and evolved Sr87/Sr86 compositions, the abundances of these elements and Sr87/Sr86 ratios were measured in grain size fractions of lunar soils from the Apollo 11, 14, 15, 16, and 17 sites in order to more precisely characterize this exotic component which has close chemical affinities to KREEP. The role of meteoritic impacts in the transport of lunar surface materials were explored. It appears that the ultimate provenance of the exotic material is at some tens of kilometers depth in the Moon, in a trace element layer excavated only by the deep Imbrium basin. The existence of such a layer is suggested by a model of the large scale differentiation. Proceeding from the widely held assumption of an initially molten outer layer of the moon, the basic physical, geochemical, and petrologic processes are modeled. The distribution of materials over the lunar surface is discussed as well as the heat production and melting temperature of the residuum layer. Dissert. Abstr.

N79-13972*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
SIGNIFICANT ACHIEVEMENTS IN THE PLANETARY GEOLOGY PROGRAM Final Report
James W. Head, ed. Dec. 1978 61 p
(NASA-CR-3077) Avail: NTIS HC A04/MF A01 CSCL 03B

Developments reported at a meeting of principal investigators for NASA's planetology geology program are summarized. Topics covered include: constraints on solar system formation; asteriods, comets, and satellites; constraints on planetary interiors; volatiles and regoliths; instrument development techniques; planetary cartography; geological and geochemical constraints on planetary evolution; fluvial processes and channel formation; volcanic processes; Eolian processes; radar studies of planetary surfaces;

cratering as a process, landform, and dating method; and the Tharsis region of Mars. Activities at a planetary geology field conference on Eolian processes are reported and techniques recommended for the presentation and analysis of crater size-frequency data are included. A.R.H.

N79-13973*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.

INTERDISCIPLINARY INVESTIGATIONS OF COMPARATIVE PLANETOLOGY Annual Status Report, 1 Oct. 1977 - 30 Sep. 1978

Carl Sagan 1 Sep. 1978 18 p refs

(Grant NGR-33-010-220)

(NASA-CR-157987) Avail: NTIS HC A02/MF A01 CSCL 03B

Research supported wholly or in part by NASA's Planetary Programs Office is summarized. Topics covered include: the evaporation of ice in planetary atmospheres: ice-covered rivers on Mars; reducing greenhouses and the temperature history of Earth and Mars; particle motion on Mars inferred from the Viking Lander cameras; the nature and visibility of crater-associated streaks on Mars; the equilibrium figure of Phobos and other small bodies; striations on Phobos; radiation pressure and Poynting-Robertson drag for small spherical particles; direct imaging of extra-solar planets with stationary occultations; the relation between planetology and conventional astrophysics; remote spectral studies and in situ X-ray fluorescence analysis of the Martian surface; small channels on Mars; junction angles of Martian channels; constraints on Aeolian phenomena on Mars; the geology of Mars; and the flow of erosional debris on the Martian terrain. A.R.H.

N79-13974*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.

EARLY CLIMATE ON EARTH-REDUCED GAS MODELS AND EARLY CLIMATE ON MARS-REDUCED GAS AND OBLIQUITY MODELS Final Report, May 1977 - May 1978

Owen B. Toon and Carl Sagan May 1978 8 p refs

(NCA2-OR175-702)

(NASA-CR-157994) Avail: NTIS HC A02/MF A01 CSCL 03B

At high obliquity, Martian polar ground temperatures could exceed the melting point of ice for considerable periods of time (approximately 90 Earth days). Under special conditions ice itself might melt. Carbon dioxide adsorbed on the Martian regolith is not expected to buffer the seasonal pressure wave except in the unlikely event that the soil pore size is very large (50 micron). For a basaltic soil composition the maximum CO2 that could be desorbed over obliquity time scales due to thermal forces is a few millibars. At low obliquities the atmospheric pressures may drop, desorbing the soil. The only means to achieve higher CO2 pressures is to have much higher planet-wide temperatures due to some greenhouse effect, or to be at an epoch before the regolith or carbonates formed. The water ice budget between north and south polar caps was considered and summer sublimation rates imply that the ice could be exchanged between the poles during obliquity cycles. A critical factor in the polar cap water budget is the interaction of water and dust. The origin of the Martian polar laminae is probably due to variations in this interaction. A.R.H.

N79-13975*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.

TEMPERATURE STRUCTURE AND EMERGENT FLUX OF THE JOVIAN PLANETS

Peter Silvaggio and Carl Sagan Oct. 1978 60 p refs

(Grant NGR-33-010-082)

(NASA-CR-157993; CRSR-707) Avail: NTIS HC A04/MF A01 CSCL 03B

Long path, low temperature, moderate resolution spectra of methane and ammonia, broadened by hydrogen and helium, are used to calculate non-gray model atmospheres for the four Jovian planets. The fundamental and first overtone of hydrogen contributes enough absorption to create a thermal inversion for each of the planets. The suite of emergent spectral fluxes and representative limb darkenings and brightenings are calculated for comparison with the Voyager infrared spectra. The temperature differences between Jovian belts and zones corresponds to a difference in the ammonia cirrus particle radii (1 to 3 micron in zones; 10 micron in belts). The Jovian tropopause is approximately at the 0.1 bar level. A thin ammonia cirrus haze should be distributed throughout the Saturnian troposphere; and NH3 gas must be slightly supersaturated or ammonia ice particles are carried upwards convectively in the upper troposphere of Saturn. Substantial methane clouds exist on both Uranus and Neptune. There is some evidence for almost isothermal structures in the deep atmospheres of these two planets. A.R.H.

N79-13976*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.

PHOBOS: PHOTOMETRY AND ORIGIN OF DARK MARKINGS ON CRATER FLOORS

J. Goguen, J. Veverka, P. Thomas, and T. Duxbury (JPL) Jul. 1978 19 p refs

(Grant NsG-7156)

(NASA-CR-157995; CRSR-697) Avail: NTIS HC A02/MF A01 CSCL 03B

High resolution photographs of Phobos taken during close flybys of Viking Orbiter 1 reveal many dark patches on the floors of several craters. The apparently dark material is only prominent at large phase angles. Analysis of the photometric properties indicates that the dark patches represent areas of unusually rough textures whose reflectance near zero phase is similar to that of the mean surface (approximately 6 percent in the visible), but whose phase curve is much steeper. The contrast of such areas is less than 10 percent zero phase but approaches 100 percent near phase angles of 90 degrees. It is proposed that these intricately textured deposits represent patches of vesticular impact melt. A.R.H.

N79-13977*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.

STUDIES OF SATELLITE AND PLANETARY SURFACES AND ATMOSPHERES Annual Status Report, 1 Sep. 1977 - 31 Aug. 1978

Carl Sagan Sep. 1978 14 p refs

(Grant NGR-33-010-082)

(NASA-CR-157996) Avail: NTIS HC A02/MF A01 CSCL 03B

Completed or published research supported by NASA is summarized. Topics cover limb darkening and the structure of the Jovian atmosphere; the application of generalized inverse theory to the recovery of temperature profiles; models for the reflection spectrum of Jupiter's North Equatorial Belt; isotropic scattering layer models for the red chromosphere on Titan; radiative-convective equilibrium models of the Titan atmosphere; temperature structure and emergent flux of the Jovian planets; occultation of epsilon Geminorum by Mars and the structure and extinction of the Martian upper atmosphere; lunar occultation of Saturn; astrometric results and the normal reflectances of Rhea, Titan, and Iapetus; near limb darkening of solids of planetary interest; scattering light scattering from particulate surfaces; comparing the surface of 10 to laboratory samples; and matching the spectrum of 10: variations in the photometric properties of sulfur-containing mixtures. A.R.H.

N79-13978*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.

RESEARCH ON LUNAR MATERIALS Final Technical Report

Thomas Gold Sep. 1978 11 p refs

(Grant NGR-33-010-137)

(NASA-CR-157997) Avail: NTIS HC A02/MF A01 CSCL 03B

Abstracts of 14 research reports relating to investigations of lunar samples are presented. The principal topics covered include: (1) optical properties of surface and core samples; (2) chemical composition of the surface layers of lunar grains: Auger electron spectroscopy of lunar soil and ground rock samples; (3) high frequency electrical properties of lunar soil and rock samples and their relevance for the interpretation of lunar radar observations; (4) the electrostatic dust transport process; (5) secondary electron emission characteristics of lunar soil samples and their relevance to the dust transportation process; (6) grain size distribution in surface soil and core samples; and

(7) the optical and chemical effects of simulated solar wind (2keV proton and a particle radiation) on lunar material. A.R.H.

N79-13979*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.
THE ORIGIN OF THE GROOVES ON PHOBOS
P. Thomas, J. Veverka, and T. Duxbury (JPL) Dec. 1977 14 p refs
(Grant NSG-7156)
(NASA-CR-157998; CRSR-679) Avail: NTIS HC A02/MF A01 CSCL 03B

Various theories for the long, linear depressions on the surface of Phobos are reviewed. Imagery from Viking Orbiters is used to map the surface distribution of the grooves, study their morphology, and date them by means of the density of superimposed impact craters. Data is presented which tends to support the hypothesis that the deep-seated fracturing was caused by a large, nearly catastrophic cratering event. It is suggested that the grooves were produced during the creation of the Stickney crater, rather than as the result of tidal stresses induced by Mars or by drag forces during the hypothetical capture of the satellite by Mars. A.R.H.

N79-13980*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.
EVAPORATION OF ICE IN PLANETARY ATMOSPHERES: ICE-COVERED RIVERS ON MARS
David Wallace and Carl Sagan Oct. 1978 44 p refs Presented at the 9th Ann. Meeting of the Div. for Planetary Sci., Am. Astron. Soc., Boston, 29 Oct. 1977
(Grant NGR-33-010-220)
(NASA-CR-157999; CRSR-706) Avail: NTIS HC A03/MF A01 CSCL 03B

The evaporation rate of water ice on the surface of a planet with an atmosphere involves an equilibrium between solar heating and radiative and evaporative cooling of the ice layer. The thickness of the ice is governed principally by the solar flux which penetrates the ice layer and then is conducted back to the surface. Evaporation from the surface is governed by wind and free convection. In the absence of wind, eddy diffusion is caused by the lower density of water vapor in comparison to the density of the Martian atmosphere. For mean martian insolations, the evaporation rate above the ice is approximately 10 to the minus 8th power gm/sq cm/s. Evaporation rates are calculated for a wide range of frictional velocities, atmospheric pressures, and insolations and it seems clear that at least some subset of observed Martian channels may have formed as ice-chocked rivers. Typical equilibrium thicknesses of such ice covers are approximately 10m to 30 m; typical surface temperatures are 210 to 235 K. A.R.H.

N79-13981*# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
ON VOLATILE ELEMENT TRENDS IN GAS-RICH METEORITES
Gerhard Bart and Michael E. Lipschutz Jan. 1979 18 p refs Submitted for publication
(Grant NGL-15-005-140)
(NASA-CR-157837) Avail: NTIS HC A02/MF A01 CSCL 03B

Ten volatile elements (and non-volatile Co) in co-existing light and dark portions of 5 gas-rich chondrites were studied. Patterns of distinct but non-uniform enrichment by dark admixing material are revealed. The dark admixing material is enriched in Cs; Bi and Tl covary in it. It is compositionally unique from known types of primitive materials and is apparently not derived by secondary processes from such materials. A.R.H.

N79-13982# National Technical Information Service, Springfield, Va.
MARS ENVIRONMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1971 - Sep. 1978
Audrey S. Hundemann Sep. 1978 245 p Supersedes NTIS/PS-77/0863; NTIS/PS-76/0841; NTIS/PS-75/752; NTIS/PS-75/031
(NTIS/PS-78/0940/3; NTIS/PS-77/0863; NTIS/PS-76/0841; NTIS/PS-75/752; NTIS/PS-75/031) Avail: NTIS HC $28.00/MF $28.00 CSCL 03B

Research dealing with atmospheric and surface properties of Mars is discussed. A few abstracts pertain to instrumentation used in the space exploration. (This updated bibliography contains 238 abstracts, 19 of which are new entries to the previous edition.) GRA

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N79-13983 Stanford Univ., Calif.
REVERSE CURRENT IN SOLAR FLARES Ph.D. Thesis
Joshua Wilson Knight, III 1978 138 p
Avail: Univ. Microfilms Order No. 7822528

An idealized steady state model of a steam of energetic electrons neutralized by a reverse current in the preflare solar plasma is developed. These calculations indicate that, in some cases, a significant fraction of the beam energy may be dissipated by the reverse current. Joule heating by the reverse current is a more effective mechanism for heating the plasma than collision losses from the energetic electrons. The model can not adequately describe the interaction of the beam with the solar plasma because the atmosphere is rapidly heated. If the time scale for this heating is short enough, the density of the atmosphere can be taken constant in time. The heating due to reverse currents is calculated for two injected energetic electron fluxes. The heating is so rapid that the lack of ionization equilibrium may produce a soft X-ray and EUV pulse from the corona. Dissert. Abstr.

N79-13984*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENERGETIC PARTICLES IN SOLAR FLARES. CHAPTER 4 IN THE PROCEEDINGS OF THE 2ND SKYLAB WORKSHOP ON SOLAR FLARES
R. Ramaty, S. A. Colgate (LASL), G. A. Dulk (Colorado Univ., Boulder), P. Hoyng (Astronomical Inst. at Utrecht), J. W. Knight, III (Stanford Univ., Calif.), R. P. Lin (California Univ., Berkeley), D. B. Melrose (Australian National Univ.), C. Paizis, F. Orrall (Hawaii Univ.), P. R. Shapiro (Harvard Univ., Cambridge, Mass.) et al Oct. 1978 120 p refs Workshop held at Boulder, Colo., 1976-1977
(NASA-TM-79660) Avail: NTIS HC A06/MF A01 CSCL 03B

The recent direct observational evidence for the acceleration of particles in solar flares, i.e. radio emission, bremsstrahlung X-ray emission, gamma-ray line and continuum emission, as well as direct observations of energetic electrons and ions, are discussed and intercorrelated. At least two distinct phases of acceleration of solar particles exist that can be distinguished in terms of temporal behavior, type and energy of particles accelerated and the acceleration mechanism. Bulk energization seems the likely acceleration mechanism for the first phase while Fermi mechanism is a viable candidate for the second one. G.G.

N79-13985*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRAL EVOLUTION OF MULTIPLY-IMPULSIVE SOLAR BURSTS Ph.D. Thesis - Maryland Univ.
J. T. Karpen, C. J. Crannell, and K. J. Frost Nov. 1978 29 p refs Submitted for publication
(NASA-TM-79663) Avail: NTIS HC A02/MF A01 CSCL 03B

Hard X-ray and microwave observations of multiply-impulsive solar bursts, identified in the OSO-5 data were analyzed. Spectra in both frequency ranges were used to determine whether or not the source properties change from peak to peak within individual bursts. Two categories of microwave spectral behavior were identified: those events during which the microwave turnover frequency and spectral shape remain the same from peak to peak, and those during which the turnover frequency and spectral shape change significantly. These categories correspond to two classes of multiply-impulsive bursts: those for which the emission can be characterized by a constant magnetic field and therefore a single source region, in which case the multiplicity may be due to modulation of the emission process; and those in which groups of component spikes appear to originate in regions of different magnetic-field strengths, corresponding to separate source regions which flare sequentially. Examples of the latter

type of events are presented. The discrete flaring regions are analyzed and their spatial separations estimated. A.R.H.

N79-13986*# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
CORONAL MAGNETIC-FIELD MODEL WITH NONSPHERICAL SOURCE SURFACE Interim Report
Michael Schulz, Edward N. Frazier, and Donald J. Boucher, Jr. 25 Apr. 1978 53 p refs
(Contract F04701-77-C-0078)
(AD-A054618; TR-0078(3960-06)-2; SAMSO-TR-78-86) Avail: NTIS HC A04/MF A01 CSCL 03/2

Previous global models of coronal magnetic fields have used a geometrical construction based on a spherical source surface because of requirements for computational speed. As a result they have had difficulty accounting for the tendency of full magnetohydrodynamic (MHD) models to predict non-radial plasma flow out to r about 10 solar radii and the appreciable magnitude, about 3 gamma, of Br (the radial component of B) consistently observed at r about 1 AU. A new modelling technique based on a nonspherical source surface is presented, which is taken to be an isogauss of the underlying potential field generated by currents in or below the photosphere. This modification of the source surface significantly improves the agreement between the geometrical construction and the MHD solution while retaining most of the computational ease provided by a spherical source surface. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N79-13987*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN INSTRUMENT TO MEASURE THE SPECTRUM OF COSMIC RAY IRON AND OTHER NUCLEI TO ABOVE 100 GeV-NUCLEON
J. F. Arens, V. K. Balasubrahmanyan, J. F. Ormes, F. Siohan, W. K. H. Schmidt, M. Simon, and H. Spiegelhauer Nov. 1978 42 p refs Prepared in cooperation with Max-Planck-Institut fuer Extraterrestrische Physik, Garching, West Germany
(NASA-TM-79677) Avail: NTIS HC A03/MF A01 CSCL 03B

A balloon-borne detector system for extending the study of cosmic ray composition to the energy region beyond 100 GeV/nucleon is described. The instrument incorporates an ionization calorimeter and a gas Cherenkov counter filled with freon for the determination of energies, and a charge module, consisting of scintillation and a lucite Cherenkov counter, for determining the charge of the incoming particle. The scintillators were utilized to determine the position of the incoming particle in addition to its charge. The characteristics of these detectors with respect to resolution, and the methods employed in laboratory calibration, cross-checks with flight data and actual performance in the flights are described in detail. Monte Carlo simulation of the ionization calorimeter and comparison of the response of the calorimeter and gas Cherenkov counter for complex nuclei was used to convert the observed calorimeter signal to absolute energy in a consistent manner. G.G.

N79-13988# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
COMPACT AND LIGHTWEIGHT MULTIGRID COLLIMATORS FOR A SATELLITE-BORNE SOLAR X-RAY SPECTROMETER EXPERIMENT Interim Report
David L. McKenzie, Charles K. Howey, and Robert M. Young 14 Aug. 1978 39 p refs
(Contract F04701-77-C-0078)
(AD-A058696; TR-0078(3960-01)-2; SAMSO-TR-78-105) Avail: NTIS HC A03/MF A01 CSCL 14/2

Multigrid X-ray collimators with fields of view of 20 arc sec and 1 arc min were designed and built for use in the CRLS-229 X-ray Spectrometer/Spectroheliograph experiment aboard the USAF STP P78-1 satellite. A systematic design approach resulted in collimators that were usable in the 0.5-5 keV range with no off-axis transmission for angles below 40 arc min. The mechanical design combined a firm and rigid mount with a capability for fine alignment adjustments during the assembly process. The collimators were provided with optical sun detectors to verify instrument pointing and reference mirrors for coalignment with one another and with the spacecraft pointing reference sensors. They were subjected to a comprehensive series of tests to assure their proper functioning and ability to survive launch and on-orbit environments. Author (GRA)

99 GENERAL

N79-13989# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: PHYSICAL SCIENCES AND TECHNOLOGY, NO. 54
22 Nov. 1978 79 p Transl. into ENGLISH from various Russian journals
(JPRS-72282) Copyright. Avail: NTIS HC A05/MF A01

Information is presented on the following topics: (1) cybernetics - computers and automation technology, (2) geophysics - astronomy and space, and (3) scientists and scientific organizations. For individual titles, see N79-13990 through N79-13996.

N79-13990# Joint Publications Research Service, Arlington, Va.
SOVIET COMPUTERS DESCRIBED c80
In its Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 7-10 Transl. into ENGLISH from Ikonomicheski Zhivot (Bulgaria), 30 Aug. 1978 7 p (For primary document see N79-13989 04-99)
Copyright. Avail: NTIS HC A05/MF A01

Information is given on work done in the U.S.S.R. to develop a unified computer system capable of creating complexes for automatic data processing. The computers are planned to have a range of productivity of 20,000, 100,000, and 500,000 operations per second and equipped with a broad range of peripheral devices and two operational systems, DOS ES and OS ES. L.S.

N79-13991# Joint Publications Research Service, Arlington, Va.
IMPROVED COMPUTER TECHNIQUES PROPOSED FOR INDUSTRY c80
Antoliy Andreyevich Modin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 11-15 Transl. into ENGLISH from Ekon. Mat. Metody (Moscow), no. 5, Sep./Oct. 1978 p 835-844 (For primary document see N79-13989 04-99)
Copyright. Avail: NTIS HC A05/MF A01

In 1977 the State Committee for Science and Technology of the USSR Council of Ministers in conformance with interested ministries and departments authorized the new wording for the Industry-wide Orderly Guidance Materials for the Creation of Automated Control Systems for Enterprises and Production Association (ASUP) (ORMM-2). Thus ten years of work by government regulation of the process of improving the control of associations ane enterprises based on the use of economic-mathematical techniques and computer technology were summed up. A brief evaluation is given of ASUP (ORMM-2) and its application. Author

N79-13992# Joint Publications Research Service, Arlington, Va.
LATEST DEVELOPMENT IN AUTOMATIC DOCUMENT PROCESSING c82
Aleksey Pershin *In its* Trans. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 16-19 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 41, Oct. 1978 22 p (For primary document see N79-13989 04-99)
Copyright. Avail: NTIS HC A05/MF A01

Through talks with scientific personnel in the U.S.S.R.'s information systems field, a bried description is given of this area, with emphasis on research and development and future applications. L.S.

N79-13983# Joint Publications Research Service, Arlington, Va.

COMPARING EVALUATIONS ON THE ECONOMIC EFFECTIVENESS OF AUTOMATED CONTROL SYSTEMS c63

S. A. Abramov and L. G. Bulkin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 25-37 Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Ekon. (Moscow), No. 5, Sep. - Oct. 1978 p 72-79 (For primary document see N79-13989 04-99)

Copyright. Avail: NTIS HC A05/MF A01

The experience gained in estimating the effectiveness of automated production control systems to produce savings is reviewed. Extensive factual material is presented characterizing the practice of making calculations of this economic efficiency. There is also an accompanying analysis of technical and economic indicators for the enterprises and of corresponding indicators for the automated production control systems. Based on a study of factual data on the functioning of a number of automated control systems, recommendations are made for improving the methodology of calculating the economic effectiveness using automated control systems. Author

N79-13994# Joint Publications Research Service, Arlington, Va.

COSMONAUT GUBAREV DISCUSSES ORBITAL TELESCOPES c89

A. Gubarev *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 50-60 Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 8, 1978 p 34-35 and no. 9, 1978 p 30-31 (For primary document see N79-13989 04-99)

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Tests conducted with the IR telescope on Salyut 4 are described. The telescope-spectrometer included a mirror telescope, coupled to a spectrometer, and a radiation detector cooled by a special cryostat. The information obtained using the IR telescope was registered in the form of a spectrum. In this range spectrography and spectroscopy were the most informative methods for studying the structure and composition of matter in space. The radiation of the moon and earth were registered. Objects present in the galactic plane and in the constellation Cassiopeia were investigated. Solar observations were conducted and the tracking mechanism was successful. S.B.S.

N79-13995# Joint Publications Research Service, Arlington, Va.

OCEAN OBSERVATION FROM SPACE c43

A. Bolshakov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 61-64 Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 9, 1978 p 32-33 (For primary document see N79-13989 04-99)

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Investigations of the seas and oceans made from Soviet spaceships and orbiting stations are described. Visual observation and television were used to establish the relationship between cloud cover and ocean currents. Other areas discussed include ocean floor topography, satellite communications systems at sea, ocean surface characteristics, temperature distribution, and petroleum pollution. S.B.S.

N79-13996# Joint Publications Research Service, Arlington, Va.

LIGHT AND COLOR ON A MANNED SPACECRAFT c54

L. Melnikov and O. Andreyeva *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 54 (JPRS-72282) 22 Nov. 1978 p 65-67 Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 9, 1978 p 32-33 (For primary document see N79-13989 04-99)

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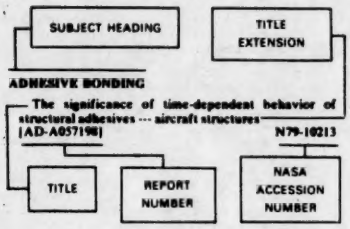
The difficulties of illumination aboard manned spacecraft and some possible solutions are discussed. Problems include weight and energy restrictions, reflections, instrument crowding, level of illumination, color effects, and biorhythms. Different illumination regimes were investigated in simulation experiments. Results show that illumination on a spaceship should be dynamic and its level in case of necessity should be increased. S.B.S

Typical Subject Index Listing



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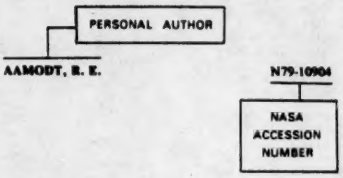

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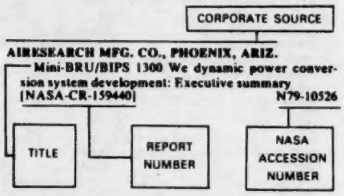

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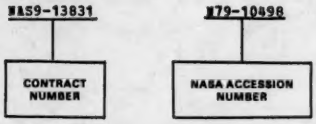

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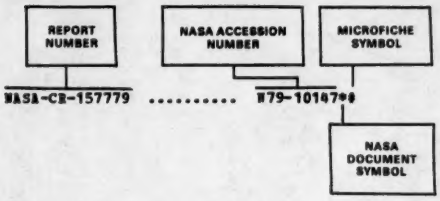

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